EDUCATIONAL MUSEUM,
HASLEMERE,
SURREY.

October 29th 1908

To the Librarian, Brit. Mus. Nat. History
Cromwell Rd.

Dear Sir,

A correspondent writes that he visited the Library at your Museum to look up some "Botanical Notes" in the "Museum Gazette", issued for one year from this Museum & then discontinued owing to the prolonged illness of the

sub-editor. He found that nos. 7-11 inclusive were missing & wrote to borrow those numbers from us. Thinking you may like a complete copy of the publication I am sending a bound volume for your Library -

Yours faithfully,

The Librarian

Haslemere K

THE HASLEMERE
MUSEUM GAZETTE

A JOURNAL OF OBJECTIVE EDUCATION AND FIELD-STUDY

CONDUCTED BY

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ASSISTED BY

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VOLUME I.

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LIST OF ILLUSTRATIONS.

Oak tree keeping its leaves in winter.

A corner in the museum. Elephant's skull with only one tusk.

THE HASLEMERE

MUSEUM GAZETTE.

No. 1. MAY, 1906. Vol. 1.

PROSPECTIVE—OUR OBJECTS.

Amongst the objects chiefly aimed at by the Museum Gazette will be that encouraging the formation of Educational Museums and of making museums of all kinds more attractive and more profitable to those who visit them. We shall not be in any sense exclusive. We propose to refer in turn to the contents of the Zoological Gardens, the British Museum, the South Kensington Collections, the British Portrait Gallery and the National collections of pictures in Trafalgar Square and at Millbank. Nor will our interest be restricted to Metropolitan institutions. Our design is not to compile catalogues but to deal in general terms with the various topics which come under notice. Thus, we venture to hope that our remarks may prove alike useful to those who may visit the splendid collections which are now to be found in many of our British Provincial cities. We shall endeavour to write alike for the schoolmaster, the private collector and the home student and to make our Journal a help to the acquisition of objective, or first-hand, information from whatever quarter it may be obtained and by whomsoever it may be desired. Our aim will be to encourage observation of the things themselves rather than mere book study. Our title connotes our undertaking. We hope to attract the student from his book to the specimen and to

lead him back from the specimen to his book. The Museum at Haslemere has, perhaps more definitely than any other, aimed at educational developments. The Museum and the Journal will be alike in this, that they are designed, not so much to assist the formation of new knowledge as to promote the wide diffusion of what is already known. Their objects are strictly educational, understanding that word in its widest sense, but with especial reference to objective aids. Our pages will not contain any lengthy original articles, nor will they ever attempt the exhaustive exposition of any one subject. We shall be frankly fragmentary, here a little and there a little, but not we trust, without constant endeavour to display the relationships of our different topics and to weave them together as a connected whole.

Amongst the special headings under which the contents of the Gazette will be arranged the following may be mentioned:—

Extracts from Expository Lectures delivered in the Museum, and Notes for Lectures.

Descriptions of Typical Museum Specimens, so written and printed that they may easily be cut out and used as Labels.

Notes of Field Natural History, under the title of our Gilbert White column.

A Lexicon Page, with the object of giving familiar definitions of such technical words as we cannot avoid the use of.

Astronomical and Geological Notes.

A Portrait Gallery.—Under this heading especial attention will be given to the history of race and the conditions which influence alike physiognomy and character.

Maps and Chronological Statements will be freely introduced. In connection with the latter, as well as with biography, we shall constantly use, and strongly advocate, the "space-for-time" method.

The Vivarium.—Under this heading will be specified the objects which may be instructively exhibited in a living state from month to month.

Lastly, for the special advantage of our younger readers, we shall give *Lists of Questions,* some with their answers and some of which the answers will be delayed for a year, in order to stimulate investigation.

Although the Gazette takes part of its name from a small provincial town, we are, as has been already implied, very desirous that our readers should understand that its scope will not be restricted. An influential part of our staff will be resident in London, with constant access to the societies, museums, galleries and gardens, which the Metropolis so liberally offers for the use of all. At Haslemere, we shall be in daily intercourse with the fields, moors and copses, which there afford, in a variety almost unequalled, opportunities for original observation in natural history. It will be our ambition there to follow, though we fear with very unequal steps, the example of the renowned author who, at the not distant village of Selborne, "Boswellised the birds and took down the familiar conversation of Nature." As supplementary alike to Metropolitan and country-side opportunities, we shall always have at command our own Educational Museum, with its Vivarium, Portrait Gallery and Library. All of these are now fairly well stocked with material for detailed study in most branches.

Explanation of Plate.

The upper figure in our plate given as frontispiece represents two oak trees of the same age and standing near to each other under precisely similar conditions. The one has shed all its leaves and the other has retained them. The photograph was taken in April. The two trees repeat the phenomenon (which is by no means an uncommon one), every winter. The leaves, of course, though kept on, were dry and brown. We shall have something to say in explanation at a future time. For explanation of lower part of plate see p. 13.

SCHEDULE OF PREHISTORIC TIMES IN BRITAIN.

The Schedule given on the next page must not be taken as anything more than a suggestion of what may have been. In no sense can it claim to be historical, for the data do not exist which would justify precise statements. It is arranged on the "space-for-time" method, which has the advantage of compelling recognition of the lapse of years without leaving any out. The spaces between the lines are all of the same duration, and include in each instance no fewer than ten thousand years. The reader's attention will be at once attracted to the fact that in the last ten thousand—or less than a twentieth of the whole—is crowded all that we have been accustomed to count as ancient British history. It is within this comparatively short period—or at most but little before it—that we must place such records of our forefathers as are supplied by the ruins of Stonehenge, cromlechs, barrows, the remains of villages, cemeteries, and potteries. For the yet earlier ages almost the only data which we possess are implements of imperishable flint. With very rare exceptions, all that was susceptible of decay has perished. These flint tools, however, afford indisputable proof of many important facts. From them we learn, in the first place, that human beings really were present on the land which is now called Britain, as long ago as a quarter of a million of years. It is with this fundamental fact that our Schedule starts. The dates assigned to the other events must be admitted to be in the main conjectural. It will be obvious, however, that the time here scheduled must have been occupied, and it is exceedingly probable that the events named occurred pretty much in the order given. It is certain, for instance, that Ireland was at one time joined to England, and England to

SCHEDULE OF PREHISTORIC TIMES IN BRITAIN.

220,000	Gradual Cessation of the Ice Ages.
210,000	Return of Southern Animals.
200,000	Men whose remains are now found in the Drift.
190,000	Elevation of Land.
180,000	Warm Climate and Tropical Animals.
170,000	Depression of Land. Submergence of Northern Europe.
160,000	Re-elevation of Land and Return of Animals.
150,000	Suggested date of detachment of Ireland from Europe.
140,000	
130,000	Palæolithic Times (Cave Men).
120,000	Cave Men (Eskimo?). Were skilful artists.
110,000	
100,000	Suggested date of detachment of England from Europe.
90,000	
80,000	
70,000	Palæolithic Man (Eskimo?).
60,000	
50,000	"Mesolithic Times."
40,000	
30,000	Neolithic Times.
20,000	Iberians, makers of long barrows—Neolithic.
10,000	Gaelic Kelts (Bronze); Brythonic Kelts (Iron); Romans, Saxons, Danes, Normans.
10,000	Present and Future Times.

the continent, and further that Ireland was detached long ages before the detachment of England.

We shall very probably at some future time republish this schedule with such emendations as the criticisms of our readers or our own further investigations may suggest. We may also perhaps be emboldened to attempt to space out in detail in another schedule the events now crowded between the lowest lines, *i.e.*, those of the last ten thousand years. In the meantime, we hope that our present venture may be of assistance to our readers in suggesting a clear and orderly arrangement, which they can expand, correct or corroborate for themselves.

NOTE.—The figures given in the first column denote the number of years antecedent to present time.

MEMORANDA AS TO PREHISTORIC MAN IN BRITAIN.

There is convincing evidence that as long as a quarter of a million years ago (250,000) there were men in England who were accustomed to the use of tools (adapted flints). It is probable that still earlier their ancestors had existed in England and other parts of the world for periods which almost defy calculation.

In answer to enquiry as to the nature of the evidence which justifies the belief that Ireland was detached from the European Continent long before Britain was so detached, it may be stated that prior to the detachment, there was in gradual progress a migration of both plants and animals from south-east to north-west. Far fewer reached Ireland than England, and many—more especially snakes, which are slow travellers—never got to Ireland at all. The number of different species of both plants and animals is smaller in Ireland than in Britain, and in Britain than in Germany.

THE DETACHMENT OF BRITAIN.

THE fall of a huge mass of the chalk cliff at Dover, which was recorded in the *Times* of last January, may serve to remind us of what, not improbably, took place when Britain was finally disconnected from the Continent. Originally lofty chalk downs extended between the two, and men pastured their flocks and herds upon them without much note as to which territory they were upon. A strong set of the sea, north and south alternately, gradually undermined the cliff on both sides, and falls, just such as the recent one, were of frequent occurrence. The broad downs were thus reduced to a mere strip. We do not know what the primæval name for such a connecting bar of land might be, but in later times it would have been known as the Franco-British isthmus. Becoming increasingly narrow it might in time be little more than a ridge on the top of a broadish white wall with precipitous sides, but encumbered at its base with masses of chalk and accumulations of flint. Probably it was narrowest somewhere near its middle, and finally in some night of storm it fell. No doubt the encroachments of the sea had been observed and the fall was expected. It may have been the case that for some time only the more courageous had ventured to cross, and that valuable cattle had been carefully kept to their respective sides. For some little time longer, no doubt at low tide, men and dogs would be able to scramble across on the broken boulders, but chalk is soft and is soon washed away. The current would run strongly through the newly made strait, and other falls of cliff on either side would soon follow. Quickly it would become evident that henceforth the coracle must be the only possible source of communication, and that all transference of flocks was at an end. The very name must be changed.

Who were the peoples who witnessed this vast catastrophe —international in a literal sense—and what was its date? We have called the men primæval, but they may have been Laplanders or relations of the Esquimaux, and as to the exact date, only conjectures can be offered. We know for certain that it occurred long after the last Ice Age, and of course long after the last submergence of that part of Europe now known as Britain. Subsequent to these events troups of wild animals, elephants, rhinoceroses, and even slow-travelling snakes, had passed westwards, and had found themselves hindered only when they reached the shores of the Irish Sea. A vast flora of eastern and southern plants had also been brought onwards towards the north-west. Whilst many of these have perished, many are flourishing to this day. After the detachment such spreading must have been much restricted, as, indeed, it already had been for many thousands of years in the case of Ireland.

In the ages which have passed since the isthmus became a strait the width of the Channel has been steadily increasing by falls of the cliffs on either side, and even at the present day, in spite of the *entente cordiale*, France and England are becoming more and more distant as regards each other.

We give the above sketch as what seems the most probable, and not without the knowledge that other speculations have been advanced; such, for instance, as that the separation was effected along the bed of a primæval river; or that it occurred co-incidentally with a great land elevation.

THE FISH-HUNGER OF VEGETARIANS.—Louis Stevenson in "In the South Seas" mentions that "in at least one ocean language, a particular word denotes that a man is 'hungry for fish' having reached a stage when vegetables can no longer satisfy." In these islands flesh food other than fish is rarely obtainable except by cannibalism, and hence the great value which attaches to fish. In most of them leprosy has long prevailed, perhaps in all. It is to this fish-hunger, which is common to all people who are for the most part restricted to vegetable food, that those who hold that leprosy is due to fish-eating attribute its prevalence near to fishing stations, and its occasional occurrence at a great distance from them.

THE HUMAN HEAD.

THE human brain-case varies much, not only in size but in shape, in different persons. These differences are often characteristic of families or of races, and are to a certain small extent indicative of character and capacity. In the main, however, they imply only descent, and as such they afford valuable data to the student of nationality and race. It must, however, always be remembered that very wide differences may be met with in the same race, and even in the same family.

The skull may be measured from before backwards and from side to side. If the proportions between these two measurements are those of the majority the skull is said to be of the average, and the fact is expressed by the term *Mesocephalic.* If the length is disproportionate to the breadth it is said to be a long skull, and its former or present possessor is described as long-headed, or *Dolichocephalic.* If the breadth, on the other hand, be disproportionate to the length the skull is said to be broad, and its possessor would belong to broad-heads, or *Brachycephalic.* It must be carefully remembered that "long headed" does not mean "tall-headed," but long in the direction from before backwards. These measurements may, of course, be roughly estimated in living men, but when accurate statements are made it is to be assumed that the skull was measured after the scalp, &c., had been removed.

It is customary to take 100 as the standard of the length, and to compare the breadth with that standard. Thus, if the skull measured as much across as lengthwise it would be $\frac{100}{100}$, and might be nearly round, but if it were only half that, then it would be expressed by $\frac{50}{100}$, and would be extremely dolichocephalic. The Negro races are good examples of the dolichocephalic, and the Turks of the brachycephalic.

European races keep nearer to the medium, but may present as varieties very marked examples in one or the other direction.

It will be seen that these measurements concern the shape of the head and not its size. Its capacity may be estimated after death by filling the skull with shot or sand, and then measuring the latter. In the living man the size can be roughly inferred from outside measurements. In making these it must be remembered that a skull which has less than the average girth may make up for it in extra height.

The terms "Prognathous" and "Orthognathous" refer to the whole face rather than to the skull alone, that is, they include the lower jaw. At any rate it is much easier to appreciate these qualities when the lower jaw is present than if it is absent. A face is prognathous if its lower parts are unduly prominent in comparison with the forehead. All animals, including all monkeys and apes, are prognathous. It is in man only, and only in some men, that the vertical or orthognathous face is met with. A retreating forehead does not necessarily imply a prognathous face.

The term facial angle is applied to the angle made between a line drawn from the ear to the nostrils, and a vertical one from the nostrils upwards. The wider this angle the less prominent must be the forehead, and the more nearly orthognathous the face.

It is of much interest to note these peculiarities as they may be observed in the heads of living persons or in portraits, or perhaps still better, as they are represented by the skilful caricaturist. It is desirable, however, to be on our guard not to attach undue importance to them, in reference either to race or character.

Round Heads, Long Heads, and Tall Heads.—The term long-headed in common speech usually means shrewd and calculating. In reference, however, to the study and classification of mankind, it means definitely a head or skull which measures more than the average from before backwards, and it must be carefully distinguished from high, or tall-headed. Let me

repeat that the scientific term for an average head is mesocephalic, for a long head dolichocephalic, and for a broad head brachycephalic. The last term is an approach to round-headed, and implies a broad forehead and a large and wide base to the skull. In a mixed population, such as that of England, by far the greater number have medium heads, but well-marked examples of long and round may be met with. If a man is obliged to be very particular as to the fit of his hats he is in all probability dolichocephalic, whereas if he can put on any hat, wear it any way, and above all, if he can turn it round on his head, he is brachycephalic. Shakespeare's portraits represent a round head, that of Sir Walter Scott a head both tall and round, whilst it might be difficult to name any well-known portrait which conspicuously displays dolichocephalism, since but few portraits give wholly side views. The portrait of the late Mr. Roebuck, as given in *Vanity Fair*, offers an extreme example.

Some curious particulars are given in Wright's "Life of Fitzgerald" as to the peculiarities of the head of Mr. Spedding, the editor of "Bacon." Fitzgerald held that his friend's head so much resembled that of Shakespeare that if he had edited Hamlet one portrait might have served as frontispiece for both author and editor. It is added, however, that the resemblance was chiefly in the high forehead and bald crown. Spedding's forehead was the subject of frequent jokes amongst his friends. It must have been remarkably broad and round as well as high, or perhaps rather than high. Fanny Kemble spoke of "the white, round object which is the head of him." Thackeray drew it rising "with a sober light over Mont Blanc and reflected in the Lake of Geneva." When Spedding visited America Fitzgerald asserted that the sailors in the Channel had mistaken his pate for Beachy Head, and said that he was sure that no Indian would be able to scalp such a forehead.

Spedding was a very hard worker. He was a literary sportsman, and was said to have come into the world for two purposes, to edit Bacon and to shoot snipe.

Mr. Wright, in another place, speaks of "poor Crabbe's animated face and *revolving hat*." This referred to a son of the poet. The expression "revolving hat" would imply a remarkably round head. Very few persons could wear their hats put on sideways, that is, with front and back over their ears ; in still fewer would that hat have any tendency to turn round on the head. Crabbe's hat is said never to have been in its right place. He was an able man, but not a genius.

Mr. Sydney Lee, in his excellent essays on Great Englishmen, has written, respecting Shakespeare and Genius :

"The difference between the results of his endeavours and those of his fellows was due to the magic and involuntary working of genius, which, since the birth of time, has exercised as large a charter as the wind to blow on whom it pleases. Speculation or debate as to why genius bestowed its fullest inspiration on Shakespeare, this youth of Stratford-on-Avon, is as futile a speculation as debate about why he was born into the world with a head on his shoulders at all, instead of, say, a block of stone. It is enough for prudent men and women to acknowledge the obvious fact that genius, in an era of infinite intellectual energy, endowed Shakespeare, the Stratford-on-Avon boy, with its richest gifts" (p. 260).

We by no means wholly follow Mr. Lee in his despairing verdict as to the impossibility of explaining the occurrence of Genius. Like all other bodily endowments, the transcendent mental capacity to which that name is given is doubtless the result of descent. What is wanted is a knowledge of the facts. Nothing comes by chance. Genius undoubtedly arises only in races and communities of high general cultivation, and it would be a pity to adopt as a creed that it comes as the wind comes. We shall have something to say at a future time as to the descent of Shakespeare and some other men of genius. For the present we must be content to suggest in the mildest possible terms that as regards the development of poetic genius, the brachycephalic head appears to have some advantages.

THE SKULL OF AN ELEPHANT WITH BUT ONE TUSK.

Our illustration shows the skulls of two elephants, in one of which there is but a single tusk. Living elephants with but a single tusk have been mentioned, and even figured, by travellers, and in several instances it has been expressly stated that the animal so endowed was an especially large and powerful one. The only skull which we have ever seen showing this peculiarity, and not improbably the only one in existence, is the one here figured, and is amongst the treasures of our Haslemere collection. It is that of a very large Ceylon elephant, shot by Mr. W. H. Varian, at Chalampi Madua, in the North Coast Province of Ceylon, in 1882. The tusk which is present is the left one (as in the narwhal). No want of symmetry is to be noticed in the form of the upper jaw, but on the right side there is no trace of a tusk, nor of any tooth-socket. The alveolus has been cut and shows no trace of having ever been injured.

The following measurements of this animal, taken immediately after death, were recently kindly supplied by the widow of the famous sportsman, who informs us that it was the one hundred and first elephant that fell to Mr. Varian's gun, and was the largest as well as his last. Height at arch of back, 11 feet 9 inches; height at withers, 11 feet 1 inch; length from the tip of the tail to the tip of the trunk, 26 feet; girth of the body at thickest part, 22 feet 4 inches; weight about 8 tons. The following skull measurements may be of interest: height, from crown to base of lower jaw, 3 feet 5½ inches; distance betwen the orbits, 1 foot 7 inches; across the widest part of the alveolus, 1 foot 4½ inches; girth of the alveolus, 3 feet 3 inches; maximum circumference (horizontal), 3 feet 2 inches; distance between the outer edge of the condyles, 2 feet.

NOTES ON ANTLERS.

ANTLERS are the more or less branched horns grown on the forehead of a stag or deer. They consist of solid bone and are shed once a year. Each succeeding set is larger and possesses more tines than its predecessor, thus proceeding as has been said,

From well to better,
Yearly self-surpassed.

In the description of antlers the following terms are in use. The rough ring at the base where the antler is detached is the *burr*. The base of the antler below the burr is the *pedestal* or *stump*. The main stem is the *beam* or *shaft*. The first branch given off just over the forehead is the *brow tine*. The next branch is the *bez tine* and the third the *trez tine*. The group of points or snags into which the antler finally breaks up are the *surroyals*. An antler may be *palmate* by coalescence of the surroyals, or it may show a "cup" at their base. The *crown* of the antler is that part from which the surroyals spring. The burr consists of nodules of bone.

When the growth of new antlers is about to commence the carotid arteries enlarge and there is a more abundant supply of blood. A thick structure now grows from the rim of the area from which the previous antler has fallen. In this structure there are abundant blood-vessels and from its inner surface bone is deposited. It is covered by a thick coat of fur, and to this the name of velvet is given. All antlers in the early stages of their growth are covered and kept warm by their velvet.

An antler has no cavity and forms no marrow. Its solidity gives it strength.

Is it as large in circumference at its base when it begins growth as it will ever be? Probably very nearly but not quite.

The head of a Deer showing young antlers covered with fur.

When its full growth has been reached the tubercles of the burr increase in size and squeeze the arteries which supply the velvet and finally block them by strangulation. This causes the velvet to die. Its death is probably attended by some sense of itching, and the animal now rubs its horns against a tree or post in order to relieve the feeling, and in this way detaches the velvet and leaves the antlers clean. These have, however, now been deprived of their surface supply of blood, and having no internal supply they in turn also die and simultaneously fall off.

The pedestal of bone upon which the antler is mounted varies much in height in different species of deer. It always grows from the back of the frontal bone, like that of the core in hollow-horned animals. It is longest in the muntjac. The longer the pedestal the smaller the antler. In the muntjac (allied to the little roebuck) the pedestal may be six or eight inches long, but the antler is very small.

A comparison may be drawn between the falling of antlers and the falling of leaves, and another between the new growth of antlers and the reproduction of limbs by crustaceans.

Why is the velvet thick on the surface? Clearly in order to keep the surface warm and prevent contraction of the arteries during exposure to cold wind. It is equivalent to a great coat.

At the same time that the antlers are growing the muscles of the neck and shoulders are strengthening and becoming bigger.

The detachment of the antler is probably the same as that of exfoliation of dead bone or of gangrenous parts. It is effected by the persisting structures below. The centre is absorbed first.

The giraffe keeps its pedestals but grows no antlers on them.

We must draw, of course, a very clear distinction between horns and antlers. True horns are not solid but hollow, and are formed on the outside of cores of bone upon which they fit. Both the bone-core and its sheath or horn are permanent, and

never, except by accident, are detached. Horns are distinctive of animals allied to cattle, sheep, goats and antelopes, as antlers are of the whole deer tribe. Yet it happens, as is the case in so many departments of natural history, that there are connecting links in which these distinctions are lost or merged. The best example of this occurs in the prong-horned antelope.

The prong-horn, or prong-buck, or prong-horned antelope occurs in North America. It has hollow horns, and the core is not branched, but from the horns themselves a single tine or prong grows. Its horns are shed, a new one forming under the old.

The antlers of different species present innumerable varieties as to form, and long familiarity is needed to assign the animal to which each belongs. Every museum ought, however, to possess a series of the more common ones.

The antlers of the common fallow deer of our English parks may be recognised by their upper tines being spread out in palmate fashion. The lower tines are all round. The antlers as a whole are more handsome and much better balanced than those of the reindeer. Only the male wears them, and they are shed every year, being reproduced each autumn with increase in the number of their tines.

The little roebuck (*Capreolus caprea*), one of the smallest of the deer tribe, has short stout horns. As is the case in almost all deer these are the possession of the males only. From the front of the shaft a few inches from its base a single strong short tine is produced and 8 inches higher the shaft divides into an expanded Y and so ends.

In the reindeer both sexes possess antlers, a very exceptional condition. Those of the male are the larger. This deer is remarkable for the length and the variability of its much-branched antlers. No two pairs are exactly alike, nor do those of a pair ever exactly correspond with each other. The main branch usually passes backwards over the animal's

Trees struck by Lightning.

neck and almost half the length of its back. From near the base of the antler, however, there is usually a strong tine which is directed forwards. Sometimes the antlers and their tines are all rounded, but in others parts of them become flat and palmated. When excessively long they are often slender.

THE SCORCHING EFFECTS OF LIGHTNING.

The illustration here given is copied from a photograph taken in a wood at Haslemere. Its object is to prove that when lightning strikes a tree it develops a globe of heat which scorches adjacent objects. In this instance only one tree was killed, and this was the only one which gave evidence of the lightning having passed down the trunk. The boughs of several adjacent trees were, however, killed, and of one the whole of its upper half was involved. This was the tree which stood nearest to the one actually struck. In the latter the bark was detached down the whole of its trunk, but in the others only the topmost branches and those which projected nearest to the one killed were involved. No better explanation than that which we have suggested above can probably be given. We purpose during the next few months to have a good deal to say about the nature and effects of lightning. For the present we desire only to impress the single fact referred to. It is one probably well known to all who have studied the subject, and which finds illustration in many lightning accidents.

ON CROWS.

(*Extract from a Museum Lecture.*)

The Crow Family (*Corvidæ*).—The crow family (*Corvidæ*) in England consists of the Raven, the Carrion crow, the Hooded crow, the Rook, the Jackdaw, the Chough, the Magpie and the Jay; we will leave out the Nut-cracker as being very rarely seen in England. The birds which have been named are remarkably alike in their general build; you cannot doubt their relationship. Look at the forms of their bodies, necks, and heads, their large strong bills, and the prevalence of glossy black in their plumage. None of them can in any proper sense of the word sing; all have hoarse, discordant voices. All are long lived. In none can you easily distinguish the male bird from the female, not even in the gaily feathered jay. There are exceptions to almost all the statements just made, but they are so few that they rather support the rule. Thus the jay has no black feathers and the chough has a long and rather slender bill, still the resemblances are such that we can feel no doubt that all are related, and what comes to the same thing, that all are sprung from a common stock. This is the lesson which I wish to illustrate and emphasise.

Permit me next to enforce my argument by referring to the identity in habits and in moral character of this interesting family of birds. They are all of them omniverous as regards food; nothing comes amiss, they will eat corn, roots and all kind of vegetables, but they all prefer animal food. Most of them will eat carrion and refuse. They have all very keen scent and will go long distances in obedience to a savoury summons. None of them are birds of passage and all show a remarkable attachment to the homes of their childhood. All are very intelligent, but none in the least degree conscientious.

In these respects they are so many Napoleon Bonapartes, consummate in the ability to attain their ends, but utterly regardless of the rights of others. The comparison might be carried into detail, for they are when domesticated museum-makers, eager to gather what others value, whilst unable themselves to appreciate the worth of what they have stolen. The raven, the magpie and the jackdaw are thieves by nature and collectors by instinct. These birds have, however, other attractive features of character. They are all more or less social, some, the rooks for instance, living in well-regulated communities, and all of them are willing to make friends with man and to receive a certain amount of education. In confinement they become attached to their patrons and show no wish to revert to the wild state.

The raven is the head of this family and may perhaps be allowed to rank as the king of birds. He takes this dignity in virtue of his complete organisation and his developed intellect. In the Bible legend ravens were most appropriately selected as worthy to bring the Prophet's food.

ADVANTAGES OF VISUALISATION.

Do you visualise? Let me explain. To visualise is to see the absent thing by the aid of the mind's eye. It is a very useful faculty; is essential to vivid imaginative realisation. Those who visualise easily are able to reinforce their will-power and often to make it efficient where it might otherwise fail. You see the steaming coffee-cup, the covered dish of bacon, and the morning's *Times*, which will all be soon awaiting you on the table, and you leap out of bed. You are punctual where a man of dull imagination for want of visualisation might have been late. A more poetic illustration of the power of visualisation is afforded in Wordsworth's lines describing the effects of the song of a caged thrush in a London street. Wordsworth evidently enjoyed a strong visualistic power, as indeed do all poets. It is essential to the craft. It is also essential to the naturalist.

THE GIRAFFE FAMILY.

The Camelopard or Giraffe (*Camelopardalis giraffa*).—We have in the African Giraffe the last representative of a group of specially adapted animals, which were more numerous in bygone times. Fossil remains of their ancestors are found over Greece, Persia, India and China, and with them those of other closely related animals now wholly extinct. Some of the latter, *Vishnutherium, Helladotherium and Sivatherium*, were much larger than the present giraffe; the latter being indeed of gigantic stature. These animals exhibit relationships on the one side with cattle (*Bovidæ*), and on the other with deer (*Cervidæ*). In all, however, their organisation had received modifications fitting them for one special mode of feeding, and they might be named tree-browsers. Their forequarters had overgrown the hinder ones, the neck had been greatly lengthened, and the eyes made prominent. They had learned to depend for safety upon their advantages in reference to field of observation and their powers of flight. Being unable to use their horns with efficiency and ease at the end of so long a neck, these appendages had ceased to be produced. The now defenceless animals had become at once timorous and exceedingly wary, but that these qualities did not suffice them for protection is proved by the fact that most of the species have succumbed to their enemies, and that unless at the present day specially protected by man, the whole family would soon be extinct.

In essential features the giraffe resembles other ungulates. It has two well-shaped hoofs, it has the bosses for a pair of horns, and possesses incisor teeth in the lower jaw only. Notwithstanding the great length of its neck there are in it only the normal number of bones (vertebræ), that is, seven. Its tail is long, with a terminal bush like that of a cow; but in

its cheek-bones are certain deficiencies known as lachrymal vacuities, which show its relationship with the deer tribe. Unlike the ox, but like the horse, it has no gall-bladder. Amongst its peculiarities are the absence of all traces of suppressed digits above its hoofs, the presence of a prominence in the middle line between the forehead and root of nose, and hair-covered stumps which represent its lost antlers. These latter are produced on bones which in young animals are not united (ankylosed) to the skull; nor are they placed in precisely the same positions as the horns of oxen or the antlers of deers, but rather further back. The stumps on the skull of the giraffe are spoken of as "horn-cores" (Owen, p. 476). They are on distinct and separate bones placed on the coronal sutures, but in old animals they coalesce. They are present in both sexes. Possibly they are more closely analogous to the pedestals for antlers in deer than to the horn-cores of cattle, &c.

The elevated eyes of the giraffe are supposed to enjoy a wider range of vision than those of any other quadruped. It is even believed to be able to some extent to look backwards. In connection with this it is of interest to note that, like the hippopotamus, it possesses a bony bulla in the floor of its orbit which serves to support the eyeball.

The colouration of the giraffe is of much interest and is not quite the same in different localities. The habitats of the animal extend from Ethiopia to Cape Colony, and there is a marked difference in colour between northern and southern districts. Although it is usual to describe its colour as consisting of chocolate blotches on a yellow ground, in some the colour is a deep brown or bay mapped out by narrow streaks of paler tint, almost white. All gradations between these may be observed, the lines of white gradually becoming wider until they constitute the greater extent and leave the darker areas as mere blotches.

The facts above stated may be studied to great advantage in a splendid group which has recently been completed in the

Natural History Branch of the British Museum (South Kensington). This group comprises illustrations of the different markings in animals from North and South Africa. All gradations may be traced from the mapping shown in our portrait to the spotted arrangement more commonly given in our standard books. Skulls are also there, and we have also a stuffed representative of the related Okapi. Of this animal as yet no living specimen has reached Europe. For the skin and skull now exhibited the Museum is indebted to Sir Harry Johnston. The animal is much smaller than a giraffe, and has a short stout neck like that of a zebra. The stumps for horns are represented by only twisted tufts of hair.

A map showing the distribution of eleven local races of Giraffes is accompanied by the following label:—

"Apart from the very distinct Somali Giraffe (*G. reticulata*), characterised by its liver-red colour, marked with a very coarse network of fine white lines, there are numerous local forms of the ordinary Giraffe (*Giraffa camelopardalis*). The Northern races, such as the Nubian *G. c. typica* and the Kordofan *G. c. antiquorum*, are characterised by the large frontal horn of the bulls, the white legs, the network type of coloration and the pale tint. The latter feature is specially developed in the Nigerian *G. c. peralta*, which is also of the Northern type. The Barongo *G. c. rothschildi* also has a large frontal horn and white legs, but the spots in the bulls are very dark, and those of the females jagged. In the Kilimanjaro *G. c. tippelskirchi* the frontal horn is often developed in the bulls, but the legs are frequently spotted to the fetlocks. Further south the frontal horn tends to disappear more or less completely, as in the Angola *G. c. angolensis*, the Transvaal *G. c. wardi*, and the Cape *G. c. capensis*, while the legs are fully spotted, and the colour pattern on the body (especially in the last-named) is more of a blotched type, that is to say, consists of dark blocks on fawn ground, instead of a network of light lines on a dark ground."

CURIOUS EFFECTS OF LIGHTNING ON FIR-TREES.

In Lord Derby's "Inval wood" on the top of Hurt Hill there are at present some exceedingly interesting objects. The trees are Scotch firs which have been spindled up to great height by close planting. They stand like so many giant cedar pencils, all much alike, and all with leaf-bearing branches at their top. They are, perhaps, sixty years old, and some are, perhaps, 80 feet high. Most of them are, apparently, in good health. Those to which it is desired to attract attention stand on the very crest of the hill, and this crest is about 800 feet above sea-level. Some ten or twelve years ago the wind made great havoc in this wood on its south aspect, with the result of leaving the trees which now concern us somewhat exposed and the loftiest objects in the neighbourhood. The trees chiefly implicated are three in number, but I might add two others which show somewhat similar conditions but much less well marked.

No. 1 of these three trees has a series of slits in its bark which all run lengthwise, and at the bottom of which dead wood is exposed. The bark at the borders of these is lifted into thick ridges by the undergrowth of the wood, so the fissures are 2 inches deep. The surface of bare and dead wood at the bottom is not large. The series of slits extends from near the ground upwards for about 20 feet.

No. 2 shows a condition which has, perhaps, never been noted before, an almost spirally fluted bole. Beginning about 12 feet from the ground strongly marked flutings, 2 inches in elevation, curve up its trunk to a height of 50 feet. They look like the ridges so often seen as the result of a climbing woodbine, but they go up far too high, and, what is more conclusive, the spiral is broken and at places is double, whilst only in one place does it completely surround the trunk. The curves are so much lengthened that for the most part the ridges appear to run almost vertically. The

bark of the top of the tree is quite smooth, the flutings ceasing abruptly about 6 feet from the top.

No. 3 is a very large tree and stands in an exposed situation. It is quite dead and the lower part of its bole is denuded of bark and left perfectly clean and smooth. There is not a trace of an insect burrow or the like to imply that the bark had remained after the tree's death. On the upper parts of the tree the bark still adheres.

The explanation of the conditions in these three trees is the same for all. It seems probable that all have served as lightning conductors. We know that the effect of lightning current passing down the trunk of a tree is to generate steam between the bark and the wood by heating the moisture in the cambium layer. The quantity of this moisture will vary much at different seasons of the year and somewhat in different trees. If, as in spring, the quantity be large the explosion may completely strip the bark or at any rate loosen it all round. If, on the other hand, the moisture be scanty then the bark may be broken through at various places and the force (*i.e.* steam) being thus liberated the detachment will be only local. This is what may be supposed to have occurred in tree No. 1, whilst in No. 3 the bark was blown completely off. The fluting in tree No. 2 was probably caused by partial detachment which simply lifted the bark without tearing, and then left it possible for the cambium to accumulate in the furrows, and subsequently to organise in ridges.

It is desirable to observe the effects of lightning on different species of trees. In the case of oaks, ashes, or beech-trees, the course of the fluid being interrupted by large branches, shattering often occurs. The straight stem of the fir, on the other hand, allows the current to pass in direct lines to the ground. We shall be much interested to know whether any of our readers who have access to fir-woods can find examples of what we may call "fluted trunks" or other evidence of damage, and further whether any more plausible explanation of the conditions described can be given than those which we have ventured.

JOHN AT THE ZOO.

There are three young lions, which a keeper told me are just one year old, their eye teeth are much smaller than those of the old lions, so I suppose they have not yet changed their milk teeth. I noticed that they are all faintly spotted like leopards, and in some places, especially about the shoulders, streaked like a tiger, neither spots nor streaks are to be seen on their backs. My father told me that many young animals show markings on the skin which fade out as they get older. "They prove," he said, "that the animals are really related to those which they imitate, and you may take these markings as proof that lions, tigers, and leopards are descended from the same stock." I went to the older lions, and looking carefully I could detect in them some traces of the spots and streaks. They had not entirely worn out.

Observing a leopard crunching a bone I realised better than ever before the use of the carnassial teeth, the animal put the bones far back in his mouth so as to bring them between his big sharp-pointed grinders, and here crunched them. I shall remember in future that the carnassial molars are for cracking up bone, and that the canines are not used for that purpose. The canines are for seizing prey and for tearing it, but not for chewing it. The carnassials are equivalent, as bone-crackers, to our grinders as nut-crackers.

The Chimpanzee has very high ridges above its eye sockets, they amount to crests. My father called them "supra-orbital ridges," and said that they made it easy to distinguish the skull of a Chimpanzee from one belonging either to the Gorilla or an Ourang-outang. They give a curious flat appearance to the upper half of the animal's face.

There is now in the Antelope's shed an animal not so big as

a large antelope which is labelled a Dromedary. I was told that it was a young one and not in a very thriving condition. It has but a single hump, and that not a large one. I was told that it is a mistake to suppose that a dromedary has two humps. It has but one, like the common camel. In fact, it is a common camel, just as a race-horse is only a common horse. It is a slenderly built and easy-going camel.

There are four or five Porcupines, all looking exceedingly well. They show all gradations between hair, coarse hair, bristles and quills. You can see on different parts all stages of modification, so that you can feel no doubt whatever that quills are simply gigantic hairs which have grown straight and become hard and polished.

I was attracted in the Civets house by the name of an animal of which I had never heard before, the Binturong. It is a black cat-like animal, as large as a small leopard, and has a magnificent tail. Its ears are pointed and tufted, like the Lynx. Its tail, which is very bushy, has the peculiarity of tapering towards the tip. It seemed sluggish. Looking it up in "Lyddeker," when I got home, I found that it is a native of Asia, but, inhabiting wild forests, is seldom seen, and still less frequently caught. It is known as the "bear-cat," but is more nearly related to the civets than to the bears or cats. It is said to be the only old-world mammal which can use its tail to hang by in climbing. When young it can suspend itself by the end of its tail. When young, like many other animals, it is spotted, but uniform in colour when grown up. It is the only representative of its genus, and species, a decided curiosity, and I am glad to have made its acquaintance.

(*To be continued.*)

A GILBERT WHITE PAGE.

We have had a succession of open and mild winters with more or less inclement spring months. The effect of these upon British bird-life is interesting. A hard winter kills stay-at-home birds and the winter migrants, but an inclement spring does not materially affect these, whilst it kills our summer visitors. If the latter arrive in cold weather no insects are to be had, and many of them die. It is matter of general remark that thrushes, blackbirds, starlings, &c., are now exceedingly abundant, and last summer there was a general agreement that the swallow tribe was poorly represented, more especially in cold upland districts.

Last spring was remarkable at Haslemere for the very successful activity of some of the gall-producing insects. Our oak trees were hung with bunches of currant galls. The pine-apple gall on spruce firs (the home of an aphis) was, on the contrary, rather scarce. As regards these matters much probably depends upon the weather which chances to prevail during the week in which the female is depositing her eggs.

Those of our readers who have access to young plantations in which spruce firs occur, should be on the look out for the gall-causing aphis. Its influence on the vegetable tissues which it attacks is nothing short of marvellous. The female aphis deposits her eggs at the base of a young shoot and embeds them in her own wool. They may be found as little masses of cotton. The effect of their presence is to cause the shoot to develop not as if for leaves but for a seed cone. The eggs are hatched out, and just as they emerge the valves of this false cone open to receive them and they crawl in. Then follows the production of a most beautiful object, the pine-apple gall. The process must be watched to be believed.

(*To be continued.*)

SEASONAL NOTES. MAY.

British Snails.

May is a good month for the shell collector. Warm showers draw many snails from their retreats. Sand hills on the coast, and gorse bushes on inland hills are good collecting grounds for *Helix nemoralis ;* the best time is an hour or two after a storm. *Helicogona lapicida* may be found in large numbers on limestone walls.

Clausilia peversa (= *rugosa*), *C. laminata* and *Buliminus obscurus* should be searched for in beech woods early in the month. Before June arrives they will all have ascended the trees, where they will remain until October.

The white variety of *Clausilia laminata* is not uncommon on beeches in some districts. It may be met with around Heyshott Down, near Midhurst, Sussex.

It would appear that the very rare *Helix obvoluta* should be looked for in company with these. Ralph Tate wrote as follows respecting its habits: " The principal locality for this shell is Ditcham Wood, Hampshire, where it may be found in abundance, but may be overlooked by one who is not familiar with the habits of this mollusk. The snail, like *Bulimus montanus*, is a great climber, and may be seen on the trunks of *Fagus sylvatica* as far up as the eye can distinguish them, a peculiarity that is not noted in our manuals. One, then, who would be repaid for his shell hunt must take pattern from that, that he would secure, and ascend the trees ; for amongst the moss and leaves at the base only dead specimens are met with. Living specimens of all ages show the epidermis clothed with hairs."

The Pine Beetle.

In some districts the young shoots of Scots and Austrian pines are attacked in May by the pine beetle (*Hylurgus piniperda*). It bores into the twig about 1 inch below the terminal point; its presence may be at once detected by the ring of white resinous matter which surrounds the entrance to its burrow. This beetle is very small, and might easily be overlooked if not carefully searched for. In our diary of May 22, 1901, we wrote "though many trees were attacked, yet, after a most exhaustive examination of more than a hundred shoots, we have secured only three beetles." It is not unlikely that the beetle leaves the burrow immediately the twig is disturbed. The bored shoots wither and become brown above the point of attack within two or three months, and are then very easily recognisable.

Galls on Oaks.

Now is the time to search oak trees for spring galls. These represent for the most part the alternate generation of those much better known, which appear in autumn. In the latter part of May "round, sappy, white and red galls, which vary in size from that of a pea to a cherry," may be found upon oak trees. They occur upon the trunks of old trees as well as saplings. On the former they are usually low down. They always grow from a bud, but peculiarities of environment often make this difficult to recognise. That they are not bark galls is always well seen when they occur upon saplings. Within each is a small maggot, the larva of a little fly which emerges in June. (*Trigonaspis crustalis*). The female punctures the veins on the under side of soft and tender oak leaves, and causes the little kidney-shaped galls so often to be seen in the latter part of September arranged in rows upon the veins. (*Biorhiza renum*). The fly emerges in December. It immediately punctures the buds, and deposits its eggs. At the point punctured the little reddish

gall above described makes its appearance early in the next year.

The gall-insect, which causes the currant-like galls on the male catkins of the oak, is (*Spahegaster baccarum*) are particularly abundant towards the end of the month. Its alternate generation is (*Neuroterus lenticularis*), which causes the flat button-like galls on the under side of oak leaves in September.

Mitrula Phalloides.

A fungus of considerable interest on account of its exceptional mode of growth may now be found by searching decaying leaves in damp places. It is the *Mitrula phalloides.* It is club-shaped, about two inches long, and of yellow or orange-yellow colour. The older mycologists, basing their classification entirely upon superficial characters, very naturally classed it under the genus *Clavaria.* It is, however, an ascomycete, the *Clavariæ* are basidiomycetes. In the former the spores (reproductive bodies akin to the seeds of flowering plants) are enclosed in little sacs or capsules (*asci*); in the latter they are borne naked on the tips of little stalks (*basidia*). There is another fungus, *Spathularia clavata,* which resembles the above in some particulars, but is always larger, and the head runs down the stem on opposite sides for some distance. In *Mitrula phalloides*, the lower margin of the head is sharply defined. There are two notches on opposite sides; these are never continued down the stem.

Puffballs.—Mr. C. G. Lloyd, the well-known American collector and student of the gasteromycetes, writes: "Would it not be a splendid idea another season to make a collection of your local 'puffballs' for exhibition in the Educational Museum? They can be kept in trays as shells, and I would be glad to furnish you with the names if you will send me specimens. There ought to be a collection of 'puffballs' on exhibit in every museum."

We thank Mr. Lloyd for his very kind offer, of which we will certainly avail ourselves as occasion requires. For many years past we have been forming such a collection as Mr. Lloyd mentions, and living specimens of local puffballs, earthballs, bird's nest fungi and other gasteromycetes are regularly exhibited in the museum during the autumn months.

QUESTIONS FOR ANSWERS.

NOTICE.—All who give satisfactory answers to the questions proposed in this column during the year's issue of the Gazette, will have their names placed on our Free List for one year. Answers should be sent not later than April 15th, 1907, to Mr. Swanton, The Museum, Hazlemere.

(1) Give the Latin names for Head, Tongue, Foot, Hand and Face.

(2) Translate *Vita brevis*, *Ars longa* and *Viresque acquirit eundo.*

(3) What do the words biped, quadruped and multiped mean.

(4) Give the Latin for Dog, Cat, Ox, Sheep and Fox.

(5) From what bones of the skull do horns grow ?

(6) Do horns grow from the same skull-bones which in other animals produce their antlers ?

(7) The eggs of the Tinamou, or Mexican Partridge, differ from those of all other birds. In what does their peculiarity consist ?

(8) In what social custom do the little Tinamous resemble the birds of the Ostrich family ? (See British Museum collection).

(9) When looking at the moon in a state of total eclipse, what is it that you see ?

(10) How did the moon originate ?

(11) Is the moon always at the same distance from the earth ?

(12) What is the meaning of the words "molar," "canine" and "incisor" as applied to teeth ?

(13) A recent Biographer, in a readable and interesting Life of the late Edward Fitzgerald, has mentioned incidentally the following facts in natural history : (1) That Ravens croak out of chimneys ; (2) That a clergyman had sown potatoes in his churchyard ; (3) That a sportsman was accustomed to shoot Grouse in his plantations. If you think these statements inaccurate, specify the error in each.

DESCRIPTIONS OF MUSEUM SPECIMENS.

[*These descriptions are adapted for Museum Labels and they may be had separately.*]

THE HORNS OF AN ELAND.

The Eland is one of the noblest of the large family of African antelopes, being almost as large as an ox. Both sexes have horns, but those of the male are the larger. The horns are massive and straight and stand erect in line with the axis of the face. In their lower two-thirds a strongly marked ridge marks a twist from left to right.

The eland of Southern Africa is of a light yellow-tan colour with a black line down its back from which pass narrow pale streaks (fifteen in number) down to the belly, whilst that of more central regions is of a pale fawn colour. They are probably only varieties (*Oreas Canna*).

THE SKULL OF A DEER.

The skulls of deer have the peculiarities that the bony core for the horn (in this case an antler) is short and ends abruptly. From its extremity the antler is produced every year. On the face surface of the skull, where the frontal, nasal, maxillary and lachrymal bones all meet, there is an aperture. A third peculiar feature is that there is at the base of the zygoma a perforation for the passage of a vein from the lateral sinus. In other respects the skull of a deer is like that of a sheep, ox, goat, or other ruminant. The giraffe has the peculiarities mentioned, and is thus to be accepted as one of the deer family. Its bone cores for horns are, however, short and never produce antlers.

(*To be continued.*)

The Historical Department.

THE

MUSEUM GAZETTE.

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OUR HISTORY ROOM. (*See Frontispiece.*)

A DEPARTMENT of our Museum to which, as regards its educational usefulness, we attach very great importance, is that which attempts the illustration of Human History. It is displayed in a separate division of the main building, and is arranged, as far as possible, on "the space-for-time method." This method, which, following the pattern of an ordinary diary, allots to every period of time the same amount of space, is, of course, possible only where the time-periods and dates are fairly well established. It is not well adapted, excepting as a sort of open and, to some extent speculative, framework for the illustration of prehistoric times. A courageous example of such use of it we ventured to offer in our last number in reference to prehistoric man in Britain. It was not history in any other sense than that the periods of time were real; the events assigned to them were largely conjectural. In the Museum itself we do not attempt to deal with very remote periods in this manner. Our space-for-time arrangement begins only with 2000 B.C. It might now, perhaps, fairly begin with 4000 B.C., but, unfortunately, we have not space enough. In this Schedule, which occupies the whole of one side of a long room (70 feet), a measured space on the wall, of nearly two feet, is allotted to each century. The centuries are marked out by strong black lines, drawn

vertically from roof to the table-shelf below. This table-shelf is 18 inches wide, and runs the whole length of the room. It is upon it that the busts shown in our frontispiece are standing. Each bust is supposed to be in its appropriate century, and with it are placed any other illustrative objects belonging to the period—medals, coins, small architectural models (when we have them), and the like. For instance, a model of Stonehenge stands in the century in which it seems probable that that most remarkable structure was built, and portions of Roman pavement and other relics mark the period of the Italian occupation of Britain. Upon the wall itself are placed engravings, photographs, and the like, illustrative of the century, and representing either human personality or some results of human effort. In order to aid the memory each century is designated by the name of some prominent person of the time, to whom other associations may conveniently cling. These names, painted in bold characters, head the columns which represent the centuries. Beneath these prominent names we have (in the case of a considerable number of the most recent centuries) put up schedules of the principal events, and lists of some of the principal persons. The appended schedule is one of them and will illustrate what is meant :—

FOURTEENTH A.D.

CHAUCER.

The Three Edwards.
Bannockburn.
Famine in England.
The Hundred Years' War begins.
Batttle of Crecy.
The Black Death (Plague).
Battle of Poictiers.
Bolingbroke dethrones Richard II.
Froissart's Chronicle.

Wallace and Bruce. Dante. John of Gaunt. Rienzi. Van Artevelde. Wickliffe. Huss. Boccacio. Petrarch. William Tell.

It will, if what we have tried to describe has conveyed its intended meaning, be seen that an observer passing slowly

down the length of the room, may appreciate at a glance the relative position of the principal events in the world's history. He can hardly avoid noticing, with fair accuracy, the distance between Homer and Socrates, between Socrates and Paul, and between the Christian epoch and the times of Milton and Shakespeare. He will be impressed at once, as, possibly, he never was before, with a perception of the brief and very recent portion of time which contains the whole of the annals of our own nation. If, in addition to thus obtaining a sort of bird's-eye view of the progress of the world, it is desired to go into detail and devote time to the enquiry, a certain amount of help will be found to have been provided on the table-shelf. Detailed schedules taken from the "The Centuries" (see advertisement) have been mounted on board conveniently for hand use, and are placed on the table-shelf at the foot of each century. A few books of reference in biography and history, and numerous maps, have also been suitably placed, and there are chairs.

The "Historical Schedule" described takes up, as we have said, the whole of one side of the long room. The other side of it, as well as much of the floor-space, is occupied by somewhat miscellaneous illustrations of prehistoric times, and of nations and races which have not as yet attained to history. The anthropoids, anthropology and ethnology in general here find illustration, in large part, but not wholly, by pictorial aid. We have also a few interesting objects suitable, as illustrating social progress, for what is now known as a Folk-Museum.

It is believed that this department of the Museum offers special facilities to teachers, who bring their classes into it and give explanations on the spot, and that by enabling the pupil to obtain a wide purview of historical times, it may do somewhat to obviate the inevitably cramping influence of the too detailed study of single epochs.

FAMOUS WOMEN AT THE NATIONAL PORTRAIT GALLERY.

We have climbed to the third landing. Let us turn into the left-hand gallery and we shall come to one of the most interesting groups in the whole Museum.

It is that which contains portraits of English women whose names have become famous in literature. Here we have Mrs. Browning, Sarah Austin, Mrs. Carter, Miss Strickland, George Eliot, Mary Somerville, and many others. The collection is not nearly so complete as could be wished—for Jane Austen, Anne and Jane Taylor, Hannah More, the Brontës, and many others are wanting—still, it is very good. But few males are admitted. Robert Browning is very properly allowed to accompany his wife, and the fact, we presume, that his wife was with him, has also gained access for Thomas Hood. A portrait of Lady Hamilton strikes us as a little out of place, but the Museum has as yet no department for female charm, and as this is by Romney it may have been difficult to refuse it. With the exception of it and one of Elizabeth Fry, all the others have more or less direct claim to be associated with literature or science. To Mrs. Opie, Mrs. Browning and Miss Strickland no one will hesitate to accord the praise of good looks, and many others exhibit in a remarkable degree the bright-eyed intelligence which we expect from authoresses. Several show a splendid breadth of forehead, the accompaniment, no doubt, of a brachycephalic or broad head. Mrs. Carter, Miss Mitford (of "Our village"), Mrs. Trimmer, Miss Strickland and George Eliot are the best, but not the only instances of this. It might be hardly good manners to describe too exactly the various features of feminine faces, and the fact that but few show the profile makes it difficult to judge accurately as to size and

shape of nose and chin. Few are, in any sense, disappointing. That of Mrs. Carlisle might have been kept back without loss, since, if it is in the least true to life, it gives a too painful sense of justification to the rumours of married unhappiness, which were probably to a large extent unfounded. The portrait of Sarah Austin, when old and ill, might also perhaps be spared, since there is a very pleasing one of her in earlier life. At any rate, the two ought to be placed together. Declining, as we do, in reference to almost the whole, the task of detailed analysis of features, we cannot, in the interests of physiognomical research, exempt those behind which lay the most profound intellect ever possessed by a woman. Mrs. Carter in classical and literary attainments, and Mary Somerville in the domain of science, must be accorded foremost places. Mrs. Browning is second, perhaps, to none in depth of human sympathy and beauty of poetic expression; but if we estimate character by profundity of insight, we shall probably accord to George Eliot amongst women much the same position as that which Shakespeare holds amongst men. We do not for a moment compare her with Shakespeare.

Of George Eliot the Museum possesses three portraits. Most fortunately, it has also one of her father. It would add enormously to the value of portraits as a means to the illustration of character, if we might always have associated with that of a distinguished individual those of his parents, and even of his brothers and sisters. The portrait of Robert Evans (George Eliot's father) is a very pleasing one—a grave, serious face, with a large Roman nose, well-formed lips and chin, and a really magnificent forehead. The nose probably gives a clue to his family descent.

Of those of the authoress herself, the first, taken when she was 23, by a lady friend (Mrs. Bray), is a poor work of art, and exhibits a commonplace face, surmounted by a very large rounded forehead. It is impossible to judge of the nose. A second is of some years older, and is much better executed. The forehead is still there, and the nose is shown of good

size and shapely, and the lips and chin are well formed. The face is a shorter one than in the next, and the hair is of a much lighter tint. The face is pleasing and attractive, not much unlike, if we remember rightly, one which represented Jenny Lind.

Lastly, we come to the often copied and well-known portrait at age 46, by Sir F. Burton. In this the nose and face are long, almost suggesting an approach to what is called a horse face. The chin is good, but as the fine forehead is much concealed by folds of hair, the balance of features is not perfect, and the whole result not pleasing. All the three show the eyes light grey or blue. There can be no doubt that George Eliot had a large forehead and a fairly large nose and chin, but further than this these somewhat dis-according portraits do not take us. We must fall back on her father's Roman nose and really beautifully balanced features.

Mary Somerville's face is a very intellectual one, but a trifle cold as regards mouth and chin. Looking at Mrs. Carter's width of forehead, no one can doubt that she had "skull-room" for many languages and what had been written in them. There is a most pleasant expression on her face, suggesting a genial companion and ready conversation, but her chin is weak and small. Mrs. Browning's face is alive with graceful vigour, and her forehead, as we have already said, is full and round.

It is held that the heads of women are dolicho-cephalic (long in proportion to breadth) in larger average than those of men. There is certainly nothing in this collection of portraits which would oppose the supposition that the higher developments of intellect in women, as in men, are usually met with in heads unusually broad. Such an inference must, however, be accepted with some caution.

THE BRAIN IN RELATION TO INTELLECT.

When we speak of size of brain in reference to intellectual endowments we must draw a clear distinction between the eminence of a specialist and that of one of wide attainments. A man may become famous as a specialist by the sedulous cultivation of one branch of knowledge, whilst far from being distinguished by wide grasp of thought. Indeed, the absence of interest in some branches of knowledge may greatly favour the exclusive devotion to a single one. Peschell quotes the weights of the brains of some Göttingen professors which were considerably below the average: Gauss, Fuchs (pathologist), Hermann (philologist), Haussmann (mineralogist).

Cuvier and Lord Byron are usually cited as having had brains much heavier than the average, but there is some uncertainty, especially as to the latter. None of his lordship's portraits suggest a large head.

Although there are considerable discrepancies in the statements of those who have examined the matter, there can be little or no doubt that the brain increases somewhat with the advance of civilisation, and that it was smaller in the prehistoric races of man than in the more advanced ones of the present age. The differences are probably not so great as many may expect, but they are real. The Australian natives stand the lowest, and the Europeans the highest. The American Indian had a larger brain than the Asiatic, and the Asiatic than the African. The Chinese stand between the European and the Negro. Two Irish skulls are perhaps the largest on record.

The size of the skull may possibly not be always a safe indication of the amount of useful brain matter contained in it. It is said that the large-skulled Germans have brains which are of lower specific gravity than those of others.

There are many sources of fallacy as regards the weight

of the brain in different persons, different races, and in the two sexes. We must not trust too implicitly to statistics or to tabulated records. It is better to be content with general results, and to state even these with great caution.

There can, however, be but little doubt that the brain of woman weighs less than that of man, and that this difference is greatest in highly civilised races. The brains of the broad-headed are, as a rule, somewhat heavier than those of the long-headed. This conclusion has been arrived at by comparing the brains of different individuals of the same race, not those of different races (Peschell, p. 70).

There are some observations which support the conclusion that the brain attains its greatest weight before 30 years of age, and then undergoes diminution. At the age of 80 this diminution is supposed to reach 10 per cent. The diminution concerns the brain proper and the cerebellum, but not their connecting part, the pons, which increases up to the fiftieth year. Whilst it is, however, difficult to imagine methods by which, without risk of great fallacy, such conclusions could be arrived at, we may safely believe that the advance of age is attended by some reduction in the size of the skull cavity and the weight of its contents.

It appears to be a constant law that with advance of civilisation the differences between the sexes in general become increased. This is seen in measurements of the skull and in the weight of the brain. In the brains of negroes the woman is but little below that of the man, 984 to 1,000, but in the English it is only 860, and Germans 838. These figures indicate, of course, proportions only, and like all other calculations in this difficult subject, must be received with caution; but they probably indicate, if they do not precisely express, the fact.

The height of the skull is usually in inverse ratio to its breadth. The variation in height is far less than is common in breadth.

The brachycephalic have heavier brains than the dolichocephalic.

In Hottentots both indices, breadth and height, are low.

The following may be mentioned as examples of remarkably broad heads (wide foreheads), in association with genius: Shakespeare, Beranger, Mirabeau, Peacock (the novelist), Miss Austen, Blackmore (" Lorna Doone "), Tennyson, Erskine.

The following had heads both tall and broad: Scott, Goethe, Cervantes, Ambrose Paré, John Foster, Father Paul, Galileo, Michael Angelo, Machiavelli, Benjamin West.

We shall be indebted to any of our readers who may direct our attention to other well-marked examples.

The following afford instances of remarkably tall heads: Motley (the historian of the Netherlands), Remin (engineer), Richard Roberts (engineer).

The following had remarkably long faces: Francis I., Inigo Jones, George Eliot (Miss Evans), Savonorola.

THE EGG MARKET IN ENGLAND.

A WHOLESALE dealer gives us the following items as to the consumption of eggs in London: When eggs are 16 for a shilling the sale amongst the working classes is enormous. When they are 12 a shilling it falls at once 40 per cent., and when only 8 it drops very low. The bulk of London eggs are imported; Italy supplies many, France many, and some even come from Turkey. They will travel from Trebizond and be perfectly fresh when they arrive in London. We are assured that most of the new-laid eggs consumed in Haslemere come from Italy, and this at all periods of the year. Our English housewives are not clever at preserving eggs, and the witty classification of eggs into new-laid eggs, fresh eggs, and eggs, is but too often illustrated.

ON OUTGROWTHS AND APPENDAGES.

(*Part of a Museum Lecture.*)

LET us draw a clear distinction between "Appendages" and "Outgrowths." The prickles which are formed on the branch of a rose are appendages; they may be detached without really breaking any part of the bush. The spines which grow on the blackthorn are outgrowths, and cannot be so detached. I wish that some better word than "appendages" could be found, for it seems almost to imply insignificance, and many of the appendages to plants are of the utmost importance. Still, it is true of them all that they may be removed and yet leave the plant, as a plant, complete, and many or most of them have only a transitory life, which does not by any means equal that of the plant itself. They are like the luncheon basket at the summer day's ramble, not absolutely essential, but very conducive to perfection. Now most forms of leaf, flower, fruit and prickle are in this sense merely appendages. From the very earliest stages of their formation arrangements exist for their separation, in whole or part, from the plants on which they are produced. You will see that I am cautious in my terms, and say in part or in whole, for in truth some appendages never are detached as wholes, and very great variety exists in the ways in which they are dealt with. For the most part they are susceptible of death, and have their fixed duration of life quite independently of the plant which bears them. In many this independent death is the cause of their being cast off. In some instances, however, it is not death, nor even sickness, but the fulness of life and the attainment of adult age which causes them to leave the parental home. I hold in my hand an oak twig with two empty acorn cups. The acorns having attained maturity, have fallen out. Shall we say they have detached

themselves, or that the tree has detached them? They have not fallen by mere weight, for they were doubtless nearly, if not quite, as heavy whilst still green, and they were then firmly fixed. You see at the bottom of the empty cup the large round scar which marks the site of former attachment. It is brown and dry. It was by changes which took place here that the acorn was loosened. The acorn had ripened and ceased its growth. It no longer attracted sap through its base of attachment, and the latter consequently became dry and brittle. Possibly its feeding tubes were choked; at any rate, it is certain that it underwent a sort of death and was no longer able to keep the acorn in place. The process was much like that which occurs in the shedding of leaves, with, however, the very noteworthy difference that the acorn itself was still alive.

We have not, however, done with our oak twig. The acorns which it bore were only appendages to an appendage, and it now becomes the turn of the cups themselves and the whole of the long foot-stalk on which they are mounted to become detached. These are no part of the tree, and are of no use to it. They were developed in order to bear flowers and fruit; that function they have now discharged, and they must die. Life is preserved only by the discharge of function, or at any rate the effort to discharge it. Utter inactivity leads to death, and death leads to separation from the living and to decay. You see that the whole foot-stalk is brown and shrunken and evidently dead. This condition ends abruptly where the foot-stalk joins the stem. At this spot, if you look carefully, you will see that there is a ring of constriction, marking definitely where detachment is in progress. This was the spot at which the production of the whole appendage began, and here a sort of joint was left at which the final detachment was destined to occur. Just one word of caution, that we must not carry our distinctions too far. After all, they are to some extent matters of degree. The joint which separates the appendage from the twig on which

it is produced can hardly be termed a true joint, for certain structures run in unbroken continuity from the stem to the appendage. These are the fibro-vascular bundles by which the appendage is fed and also fixed in place. These bundles are usually quite visible in the scar-surface left when a leaf or fruit is broken off. They are "the nails in the horse-shoe" of the leaf-scar of the horse chestnut. Still, it is certain that a sort of joint is present, and that the structures are continuous in a very different sense from that of a stem or true branch. You may observe this difference in my acorn-bearing twig, for there are two acorn cups, and one has been produced by a branching out from the stem of the other. This little branch is smoothly continuous with the parent branch, and shows no preparation for detachment whatever.

Thus we have seen that the arrangements under which leaves are shed are exactly repeated in the case of fruits, and that it is by no means needful that the object to be detached should be dead or dying. It may perhaps surprise you to be told that sometimes appendages are shed which have by no means accomplished their prospective work. Some plants shed their flowers and do this deliberately, having made their arrangements for a step which is apparently suicidal. In reality it is not suicidal, nor is it one of limitation of population, but simply of preferential employment of capital. The potato gives a good example of this. Every spring you may see on the heads of this plant beautiful flowers produced, which are destined in the course of another week to be only flowerless foot-stalks. The flowers break off at a pre-existing joint, just as leaves are shed. The influence which causes them to fall is inability to attract sap, in consequence of inability to proceed to the further stage of producing fruit. The young tubers underground make such overpowering demands upon the sap-furnishing capabilities of the roots that the flowers cannot obtain sufficient for their seed forming. Thus they at once die: if not obviously, at any rate practically, and detachment follows as a natural result.

pads, no tusks. The canine teeth in the lower jaw, which look like incisors, are much specialised in being cleft or notched.

It is a case of competitive growth and the tubers win. After a time the plant will in the course of inheritance learn that it is useless to produce flowers, will give up the attempt; indeed, many varieties have already done so to a considerable extent.

No better instance could perhaps be given of the law which goes through all animated Nature that activity is almost essential to continuance of life, whether in individuals or their parts.

THE OLDEST FOSSILS (Lingula).—It is a noteworthy fact that these, the oldest fossil animals known, belong to species by no means low in the scale. Yet every trace of the many millions which must have preceded them, and have gradually led up to their development, have perished. The period of time which must have elapsed subsequent to the advent of life upon the planet and the development of the lingula mollusc was probably quite as long as that which has passed since the lingula left its shell in the mud of the Portmadoc slate. The oldest fossils which are known are found in the lower Cambrian rocks. They are small oval shells, which were, during life, the protection of small soft-bodied sea animals of highly complex structure: they had red blood. Their descendants are still found in great numbers burrowing in sand on the shores of tropical oceans. They have received the name of Lingula, and have in turn conferred that name on certain hard rocks in which their shells occur in abundance, the "Lingula flags" of Wales (RAY LANKESTER).

HUGE SHARK'S TEETH.—Ray Lankester figures, in his interesting lectures on extinct animals from which we have quoted the above a gigantic shark's tooth. It is that of the *Carharodon megalodon*, and is three times the length of the tooth of any living shark. Specimens of this fossil tooth of smaller dimensions are common, and one should be found in every museum. They are obtained from the bone bed of the Red Crag at Felixstowe, but were not originally deposited in it. Many of them have fragments of a yet older sandstone adhering to them. Lankester calculates that his shark was 100 feet long.

THE GREAT FAMILY OF THE CAMELS AND DEER.

The Camel, the Camelopard, the Musk-deer and the Deer are all more or less nearly related. They constitute a branch of the great family of Ruminants, and all chew the cud. With the Camel are associated the Bactrian or two-humped Camel, the Alpaca, the Llama and the Vicuna. With the Giraffe we have the Okapi, and several extinct animals. The Musk-deer stands almost alone. Of Deer there are a great many species. It is easy enough to distinguish these various animals the one from the other when seen living in a Zoological Garden or stuffed in a museum. Indeed, at first sight, there might seem to be no great similarity between a Camel, a Giraffe, and a Fallow-deer. To the student of natural history, however, it becomes of great interest to observe the essential peculiarities of each. These may be grouped as those which prove relationship and those which show differences. We will leave aside the very important peculiarities in the stomach, because but few of our readers will have opportunities for examining them, and will confine our attention to the feet, horns, skull and teeth. All have two hoofs or more, and the Camel group have behind their hoofs a pad which covers the sole. None of them have hollow horns, and in none are their weapons of offence—horns, teeth, tusks, &c.—very effective. In all when adult the cutting teeth (incisors) in the upper jaw are absent, and in most the canines are either absent or much modified.

The Camel tribe differ from Giraffes in possessing a pad, and in having, when young, incisor teeth in the upper jaw, and fewer lower incisors by two. They have also strong canines in both jaws, no trace of horns, and nothing to be called tusks.

The Giraffes have two, three, or even five abortive horns of very peculiar development. They have very long necks, no

The little Musk-deer has no sort of horn; but his upper canine teeth are large and form tusks.

The true Deer have antlers (in the male), which they shed every year. The males, and sometimes the females, have canine teeth in the upper jaw. The antlers are dermal bones, that is, are formed in the skin, and do not grow from the skull. They have two rudimentary digits above the hoofs.

The whole of this group, which we may call the Camel and Deer family, are almost wholly defenceless, the Giraffe the most so of all, and, excepting those which are useful in domestication, are threatened with extinction. The Camels and the Llamas, although separated as distantly as Peru and Arabia, have in common the very peculiar habit of snorting most offensively at those who oppress or annoy them.

This large family of Camels and Deer stands between a small one which comprises Pigs, and a very large one, to which Cattle, Sheep, Goats and Antelopes are assigned. Pigs are not ruminants, and have incisor teeth in the upper jaws. Cattle, sheep, &c., like camels and deer, ruminate, and have no cutting teeth in the upper jaw. Their distinctive features are hollow horns (which are present in both sexes), and the invariable absence of tusks.

The canine teeth in all members of the Giraffe group are peculiar, in that they show a cleft in the free edge which divides them into two lobes. These teeth look as if they belonged to the incisors, but various facts prove them to be really the canines. Those of the extinct Sivatherium, and those of the recently discovered Okapi, have similar peculiarities, and thus prove their relationship.

It is curious that our natural history authorities are not yet agreed as to whether the Giraffe has his fore limbs longer than the hind ones or not. Claus and Sedgwick say, "hind legs much shorter, and therefore the back slopes backwards." Those who have measured the bones, however, say that there is no difference, and that the slope depends entirely upon the setting of the shoulder blade.

ENGLISH EDIBLE SNAILS.

"Wall-fish."

The term "wall-fish" will be unknown to many of our readers. It is applied by dealers in Covent Garden and other markets to the common garden snail (*Helix aspersa*). This mollusc is held in especial esteem by the poor in Bristol, and in consequence is now very scarce in the environs of that city. There are men who make a livelihood during the winter by collecting these snails from their hybernating places. In November, 1896, the writer met a "wall-fish" collector in a remote village in Somerset, and had an interesting conversation with him. He was collecting for a Bristol dealer, his home being in Kent, where he worked as a carpenter in summer and autumn. For many winters past he had regularly visited Somerset to collect snails. According to his experience these snails seldom hybernate in banks facing east or north, but usually seek winter quarters in those facing south-west.

They generally congregate in some numbers, and appear to have a predilection for certain spots. From an hybernaculum near the village he had that morning taken a gallon and a half of them, but this was very unusual; his "takings" as a rule did not exceed a gallon per day.

Ash stumps, or crannies at the base of ash-trees, are very favourite haunts. They seldom hybernate under oaks, and although old walls are favourite places in summer, whence they probably owe their name of "wall-fish," they seldom hybernate in them.

Our "wall fisherman" carried an iron rod about 2 feet long, slightly crooked at one end for probing likely nooks and corners. *H. aspersa* is quite the most nearly domesticated of the snail tribe. It loves the haunts of man, and is seldom found in any numbers in places remote from villages and roadsides.

A conchologist should never miss an opportunity of examining the bag of a wall-fish collector. Occasionally rare varieties—*scalariforme* for instance—may be secured in this way. I asked my friend to allow me to inspect his "catch," and he very obligingly turned out the contents of his creel. I found nothing better than three or four examples of the variety *exalbida*, which is greenish-white. It is, however, widely distributed in the southern counties. It is stated by Forbes and Hanley ("Hist. Brit. Moll.," vol. iv., p. 46), that "owing to its being an article of food in some countries, or else a supposed remedy for pulmonary affections, *H. aspersa* has been transported and distributed by the agency of man to all parts of the world. It is especially abundant in the neighbourhood of gardens." In 1840, according to Turton, *H. aspersa* was sold in Covent Garden and elsewhere as a cure for diseases of the chest, and was sent to the United States as a delicacy. "The glassmen at Newcastle once a year have a snail feast; they generally collect the snails themselves in the fields and hedges the Sunday before the feast day." This feast is, we believe, now given up.

DORMANT LIFE.—The conditions under which vital activity may become dormant obtained a curious illustration in the instance of a beetle which was taken alive out of the wood of a desk which had been in the office of the London Guildhall for twenty years. The wood was deal from the Baltic, the beetle was the *Buprestis splendens*. It was alive and in beautiful colour. The observation was confirmed by Sir Joseph Banks. The description is given by Mr. Thos. Wrenham in the tenth volume of *Transactions of Linnæan Society*, 1810.

DODDER AND IVY.—Ivy is a climber only, Dodder is a true parasite. Ivy does not in any degree derive nourishment from the trees on which it grows. It is obvious that it cannot get any from walls. It may be plausibly disputed whether it does any injury to the trees to which it clings, for it is often seen on very large ones. It is reputed to be wholesome for sheep and deer in spite of its rank odour, and pheasants are fond of its seed.

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HOW TO FORM A TEMPORARY MUSEUM.

A temporary museum will, in all probability, be a Vacation- or Summer-museum; there will, therefore, be no need for stoves or fires, and scarcely any for artificial light. The sun rises in summer as early as any members of the museum committee are likely to be stirring, and by sunset it will be time to close. We will suppose, then, that the season is summer and the place a small town in the country. In the first place a small local committee of those interested in the scheme should be formed, and a small sum of money guaranteed. The next step should be to borrow a set of school premises, or hire for a couple of months an empty house. If only a small cottage were obtainable it should have a back garden in which a large wooden shed could be put up. The essentials are plenty of room, plenty of light, and good protection from weather. If the premises secured be those of a school, the next thing will be to arrange with some carpenter for the hire of a quantity of boards which, laid across the desks, will make tables. It may be possible, on similar terms, to obtain from a draper a quantity of baize, or its very cheapest equivalent, but this would not be absolutely necessary. Having secured plenty of table-space, the next point is to prepare the walls. It will be required to display on these, Portraits, Maps, Illustrations, &c., &c., and for pinning these up some sort of framework is desirable. The carpenter will soon put this together and cover it with baize or flannel.

The rooms being made ready, the next step is to fill them, and about this there will be no difficulty. As a preliminary measure a circular will have been sent out, inviting all residents to contribute their curiosities on loan. It will be strange if this be not bountifully responded to by cases

of stuffed animals and birds, collections of eggs and of shells, and boxes of minerals. Ammonites, elephants' teeth, mammalian skulls, butterflies, wasps' nests, flint implements, and Missionaries' curios will be brought in great abundance. All these, properly arranged, with descriptive labels, may be made most interesting and instructive. A certain number of glass-covered display-cases, with locks, will now be required in order that fragile or valuable specimens, and especially those on loan, may be properly taken care of. Such cases may be made inexpensively, and our Haslemere Museum will be glad to supply patterns, or even, if wished, to loan the cases themselves.

At this stage the Committee should remember that a museum has been well defined as "a collection of labels illustrated by specimens," and should obtain, if it has not already done so, a set of our printed labels, and ascertain for how many of them illustrative specimens can be produced. Steps should next be taken to obtain elsewhere any specially desirable exhibits which may not be forthcoming. Some Horns, Antlers, Skulls, &c., are sure to be wanted, and no doubt the Geological series and the Flint implements will need to be supplemented. These deficiences may be supplied in some instances by borrowing from other adjacent museums, or they may be purchased at various dealers.

A very important and attractive department of the temporary museum will be the display of Pictures, Maps and Portraits. These, like those just mentioned, may be hired, if they cannot be begged or borrowed. A diligent ladies' sub-committee, well supplied with bundles of old unbound copies of *The Illustrated London News*, *Graphic*, *Vanity Fair* and *Punch* would soon construct an attractive portrait gallery, as well as sundry most interesting series in illustration of social history, scenery, geography and natural science. There is not anywhere a small town in which material of this kind may not be brought to light from the cupboards in which it is uselessly stowed away. The best way of dealing with it would be to procure

some false-backed frames, such as we have in use at Haslemere. In many instances portraits, maps, &c., will not need to be put into frames, but may be at once pinned up in well-classified series on the walls.

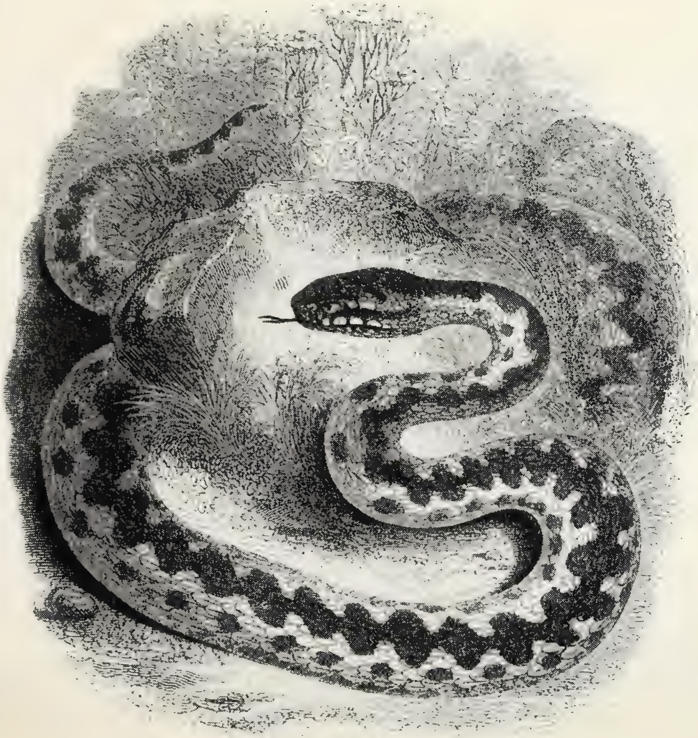
We have said nothing as yet as to a department which ought to be made one of the most important, especially at a sea-side resort. A Vivarium for the display of local specimens in their fresh and living states should be arranged either in an ante-room or hall, or in a shed, or under a verandah outside the building. In this should be a stand for flowers (all named), and bell glasses and large saucers for the reception of shell-fish, sea anemones, sponges *au naturel*, seaweeds and corallines. Illustrations and explanatory labels for most of these our Haslemere press can supply.

The charges for admission to the show should be: before its completion, sixpence each person; when complete and in good order, threepence for adults, half-price for children; and on Saturdays a penny all round. Books of tickets, making a very liberal reduction, should be available. The result would be, if circumstances were favourable and zeal abounded, that the guarantors would lose nothing and might possibly carry forward a modest balance to begin next year with. Meanwhile the prosperity and reputation of the sea-side resort would have been helped and a large number of persons would have been entertained and instructed.

The following paragraph appeared a short time ago in one of the daily papers:—

> The complaint is often made that there is little opportunity to learn anything about the specimens exhibited in museums. At Brooklyn the experiment has been tried of placing for the use of visitors books bearing upon the subjects exhibited alongside the cases. This experiment seems to have been most successful.

The Brooklyn experiment is not a new one. It has been practised for many years past in our museum (*vide Museums' Journal*, vol. ii., 1902).



The Viper.

The Common Snake.

BRITISH SNAKES.

We have in Great Britain only three representatives of the class Reptilia which come under the name of Snake They are the Common Snake, the Smooth Snake and the Viper. In Ireland there are—as the result of events to which we referred in our previous number—none at all. Of the three British Snakes, one, the Smooth Snake,[1] is so rare that it is of interest only to the naturalist. It is met with in Hampshire and Dorset, and perhaps in Scotland, but it is nowhere frequent. It is more nearly allied to the Common Snake than to the Viper, and is quite harmless. It is much smaller than the others. We will concern ourselves for the present only with the other two. The Common Snake[2] is quite harmless and should never be injured by any humane person. The Viper[3] is venomous, and should be destroyed without mercy. It is easy enough to distinguish between the two even when in movement. The Common Snake is always, when full grown, much longer than the Viper. It may measure 4 feet and is usually 3, whilst the Viper is never more than 2. The Common Snake tapers off very gradually at its tail, whilst the Viper has a short tail, which is abruptly constricted at its base. The Viper is usually brown, often deeply coloured, whilst the Snake is much lighter coloured, of a light grey-brown tinged with green. The Common Snake has only spots of black, whilst the Viper is marked down the whole of its back with large zig-zag black lozenges. This is a most important feature, is characteristic at all ages of the animal, and is easily seen under all conditions.

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[1] *Coronella lævis*, or *austriaca*.
[2] *Tropidonotus natrix*, or *Natrix vulgaris*.
[3] *Pelias berus*, or *Coluber verus*.

We have named the characters which are most easily seen when the animal is gliding about on the sward or path, there are others which are available when the animal is dead or in captivity. Under such conditions it will be seen that the scales which clothe the Viper are much smaller in size than those of the Snake, more especially on the head, and further, that the head of the Viper is marked with black, somewhat in the form of the letter V.

Snakes, as well as Vipers, have sharp teeth, but they use them only for seizing their prey, and they have no poison fangs.

The venom apparatus of the Viper consists of a gland which secretes the poison, a receptacle which stores it, and a long, sharp fang, which can be extruded and through a groove in which the poison is conveyed. The animal darts open-mouthed at its enemy rather than bites. Its fang being in its upper jaw it becomes well exposed when the mouth is agape. As there is a fang on each side there will usually be two punctures in the skin about a third of an inch apart.

No doubt there occur every year in England a good many instances of viper-bites in men and boys. There are, however, exceedingly few deaths, and many persons of considerable experience have doubted whether the bite is ever actually fatal. A very urgent and severe illness is almost invariably the result; but the patient just pulls through.

In a case in which the writer was, in boyhood, a particeps two fine vipers were captured in mistake. They were put into a botanical box and were repeatedly inspected, and their tongues freely touched. It was only when on arrival at home that one of them, during an attempt to transfer it to a cage, made a dart and struck the finger of a boy of fourteen. The accident was concealed until, about a quarter of an hour later in attempting to cross the floor, the victim fell down in a deadly faint. He became very sick and having been got to bed remained in collapse, apparently near death for several hours. Brandy was of course freely given.

The medical adviser who had been summoned, arrived in hot haste with a big volume under his arm, in order to make reference to "snake-bite" and its treatment. It was, however, too late to do anything more than give stimulants, and happily these were successful. A fortnight's illness ensued, during the early part of which the whole arm was enormously swollen, and later partly covered with boils.

This case affords, we believe, a very fair example of what usually follows the incautious capture of the English adder. The reptile does not attack willingly, but only after much provocation, and he cannot, as a rule, destroy the life of his human enemy. His poison fangs are designed for other purposes, and for much smaller animals.

Within the last few weeks a case at Folkestone has attracted much attention, in which two school-boys in pursuit of what is called "Nature Study," were bitten by a viper, with the result that one of them died. Several other well-authenticated instances of death have been recorded. We repeat, however, that they are very rare.

The early summer is the best time for killing vipers, since the males, which at other seasons hide themselves, may now often be found. Warm heaths and banks exposed to the sun are the places which they frequent. The common snake, on the other hand, loves water, or may be found in a hay-field or near an old barn or on a dung-heap. The snake lays eggs and leaves them to be hatched by the heat of the dung or the rays of the sun, taking no care whatever for her progeny. The viper, on the contrary, brings forth her young alive and tends them carefully, even allowing them, according to fairly well-accredited narratives, to retreat in case of danger into her mouth and gullet.

The first aid in case of viper-bite should consist in placing a tight ligature (string or a boot-lace) around the limb above the punctures. This should be as tight as possible so as to prevent the circulation of the blood and passage of the venom towards the heart. Next, incisions should be made across

the punctures, or if circumstances are favourable, the bit of skin comprising the two punctures may be cut out. The wound thus made should be sucked or well bathed so as to favour bleeding, and to remove as much of the poison as can be got away. If ammonia or potash, or Jeye's fluid or Condy's fluid be at hand the wound should be continuously bathed with a weak solution of it. The ligature, if tight, should not be kept on for more than an hour, but by this time medical advice will probably have been obtained. To combat the faintness, &c., brandy, or still better ammonia (that is, sal volatile or hartshorn well diluted), should be given.

THE VIVARIUM. (Haslemere Museum.)

During June and July the botany of a district may be very fully illustrated in the Museum-vivarium. Mr. Douglas Taylor, who has charge of that department in our Museum, experiences no difficulty in exhibiting one hundred species simultaneously. No very rare species are exhibited. At the present time the only plants in our collection to which the term "uncommon" may be applied are herb Paris, bird's nest orchis, Solomon's seal, and climbing corydalis. The flowers are arranged, in zinc cylinders, on an ordinary florist's stand. For the printed labels now in use we are indebted to the generosity of E. E. Lowe, Esq., F.L.S., of the Plymouth Museum.

Vipers and grass snakes are not difficult to obtain (see page 53). The former, when discovered, should be carefully pinned with a stick, whilst a vasculum (or large bottle) containg leaves and heather is placed before it. Upon release the viper, judiciously guided by the stick, will take refuge in the receptacle prepared for it. Grass-snakes thrive well in captivity, their chief food being frogs and mice. On the other hand, the English viper nearly always refuses food under such conditions.

Our vivarium contains, in addition to the above, two of the three British newts, viz., *Lophinus punctatus* and *L. palmatus.* The former, though usually spoken of as the "common newt" is in many districts (as at Haslemere) not so common as the palmate newt. The latter is smaller, and the tail terminates abruptly in a threadlike filament, instead of gradually tapering to a point.

An ants' nest contained between sheets of glass, on the plan devised by Sir John Lubbock (Lord Avebury) and described in his "Ants, Bees, and Wasps" (p. 2), always proves a source of attraction to visitors in the winter, as well as summer months. We have had for two seasons past a nest of the amber-coloured meadow ant (*Formica flava*) displayed under these conditions. It is probably the most intelligent of European species, forming the grassy hillocks from 9 to 18 inches high, so commonly seen in some districts. The queen, which is much larger than either workers or males, requires very careful searching for upon opening a nest; but the peculiar little white woodlice (which delights in the long name of *Platyarthous hoffmanseggii*, they are a sort of guest of the ants) may be always easily discerned.

Every spring we take out of the Museum and arrange in this department a series of our summer migrants, accompanied with general notes on bird migration. The following may be seen now: Swallow, martin, swift, sand martin, cuckoo, corncrake, nightingale, wryneck, nightjar, redstart, Yellow wagtail, garden warbler, wheatear, chiffchaff and whinchat.

Kept under a bell glass and fed with lettuce and cabbage leaves are some half a dozen examples of the large edible or vine snail (*Helix pomatia*), the largest of our native land molluscs. This species occurs chiefly on the chalk in the southern counties. At one time it was supposed to have been introduced by the Romans, but of late years the opinion has gained ground that it was indigenous. In the same quarters is

an example of a-shell slug, the *Testacella haliotidea*, sent from Torquay. The shell-slugs differ from ordinary slugs in having a shell on the tail. They are carnivorous and feed upon earthworms, which they pursue in their burrows; hence may be considered as gardeners' friends.

A GILBERT WHITE PAGE.

(*Continued from p.* 27.)

THE curious effect of insect attacks in stimulating the growth of certain parts of the plant which they have damaged may be found illustrated in hundreds of instances. We have just mentioned the pine-apples on the spruce fir, but the currant gall on the male catkin of the oak is yet more striking. In this case a structure which is naturally very shortlived has its vigour enhanced and its life prolonged by the presence of the parasite. In this instance the fly attacks the pollen-bearing flowers and deposits its eggs. These flowers would, in the ordinary course, wither and fall as soon as the pollen has ripened and been blown away. Under the stimulating influence of the larvæ, however, sap is attracted, their stems thicken and become fleshy, and instead of withering, they produce what looks like a handsome bunch of currants.

Another instructive instance of parasitism stimulating growth may be observed at this season in any patch of the common field thistle. Some of the plants are almost sure to be affected by a parasitic fungus. It is present in the stole of the plant, and its influence will cause the affected plants to put forth leaves earlier than the healthy ones. They will also grow faster, and in the course of a month be twice the height of their fellows. The fungus grows in the stem, and finally it will flower out on the surface of the leaves. When this happens the plant will die, but up to that period its

growth has been notably vigorous. The fungus is the *Puccinia suaveolens* (*see* Plowright, p. 183.) In some plants it is visible even in early spring, and if abundant will dwarf the plant so affected instead of stimulating its growth.

SEASONAL NOTES. JUNE.

It is scarcely too much to say that "leafy June" is the month in the year least favourable to natural history observation. Its glorious beauty is distracting and the profusion of objects of interest hinders attention to any. We hope, however, that our last month's Notes may have directed the attention of some of our readers to certain special topics and particularly to the wonders of Gall-formation now in progress. The pine-apple galls on the spruce firs are now in full growth. Two varieties will be abundantly found. Some are small, not bigger than large peas, and remain green. These are covered with spines rather than scales. Others much larger have scales, which at their margins are beautifully tinged with various shades of red and crimson. These are the "pine-apples" and these alone simulate true cones. Their changes will advance rapidly and already their valves may have opened and allowed the aphis larva, which has escaped from its egg at their base, to crawl up and enter. This most remarkable process may be verified by any one who will watch carefully.

Those objects of universal disgust, the Cuckoo-spits, may be shown to have features of interest which will to some extent counteract the repugnance of all juvenile naturalists. Hidden in a mass of iridescent spume there will be found a little greenish insect revelling in the double luxury of warmth and moisture, to which perhaps is added a paradise

of many-coloured light. The observer's attention may be attracted to the fact that the insect has chosen chiefly thistles and nettles as its hosts, these not being likely to be eaten by cattle. Later in the season it will be less careful. The insect here concerned, although a relative of the "plant lice," is not a true aphis.

June is the month for the Orchis tribe. The Bee must be looked for in its earliest weeks or never. So also of the Spider and the Frog. Others continue in flower much longer, but almost all are in their perfection in June.

Rhododendrons are now plentiful, and the very interesting arrangement by which their anthers open at their points to discharge their pollen may easily be observed. It is characteristic of the whole family of heaths, but as the anthers of rhododendrons are far larger than those of our English heaths, it is best seen in them.

Those who have never observed it before will be amused to be shown the jack-in-the-box manner in which the curled up stamens of the Broom spring out when the bee touches the shoulders of the petals. June is the month for Broom and both will soon be past.

Amongt our summer visitants the pretty little Turtle-dove is one of the last to arrive. It waits until the season is well settled and rarely comes to us before the middle of May. As perhaps a result of this caution its numbers remain each year much the same. We have now plenty of turtle-doves at Haslemere, whilst all representatives of the Swallow tribe are scarce. Some observers think that Nightingales also have been less frequently heard this spring than usual. Their song, which ceases when the young are hatched and the business of feeding begins, will soon be over for 1906.

Speaking of Birds of Passage, we may say that we shall be glad to receive from any readers in different parts of the kingdom, estimates of the year's abundance of the various species. The spring was remarkably variable, and much of it cold, and this may have had the result of much diminishing

the supply of food which would await our guests. So far as our enquiries have gone we believe that there is a general impression that the early spring migrants are this year somewhat defective in number.

Peach and Almond trees, with their leaves curled, distorted and thickened, some yellowish-green, others rosy or purplish, are infested with a fungus, scientifically known as *Exoascus deformans.* It is one of the ascomycetes; in the same genus is included the fungus responsible for the "witches' besoms" of our birch-trees. At maturity the fungus bursts through the cuticle of the leaf, coming to the surface to disperse its spores or seeds. The part of the leaf with the ripe spores upon it, is minutely velvety; the whitish bloom may be easily seen with the unaided eye, but of course individual spores could not be seen without the aid of a powerful microscope.

It is said that this disease is very rarely seen in seasons following an uniformly mild spring.

At the moment of writing we have not observed many oaks defoliated by caterpillars. The following note is taken from the Museum Record Book, June 1, 1899: "Oak-trees badly attacked by the larvæ of the green leaf-roller (*Tortrix viridana*), which cause much damage to the foliage. The continuous falling of the excreta of these small caterpillars sounds like paper being pricked by a fine pin, and is very noticeable in a quiet wood." In 1902 these larvæ were again equally troublesome in this district.

The ingenious work of the leaf-rolling Beetles (*Genera apoderus, Attelabus and Rhynchites*) may be observed at this time of the year. The female, in some species, rolls a leaf into a tube, in others she makes a compact little thimble of the upper half of the leaf, in the centre of which she puts an egg. Hazel, oak and chestnut leaves so folded are not uncommonly seen in this district. Specimens may be usually seen in the vivarium towards the end of the month.

June is a good month for the observation of what are

termed Social Flowers. The veronica, in many meadows, especially those in which the grass is kept short by grazing, now exhibits round patches of several yards in diameter, which are beautifully blue. The little mouse ear (Myosotis) makes similar patches, but in much less conspicuous tints. These plants appear to have the power not only of spreading themselves, but of excluding intruders, and their territories sometimes show no other form of vegetation. The common daisy is also a social flower, but much less able to keep others at a distance. So also the wild strawberry.

QUESTIONS FOR ANSWERS.

(*Continued from p.* 31, *which see.*)

(14) Give the meanings of the following prefixes: (1) sub, (2) pseudo, (3) ob, (4) hypo, (5) hyper, (6) para, (7) ab, (8) aero, (9) con, (10) amphi, (11) ana, (12) pro.

(15) The late Mr. Holyoake tells us that as the result of a street accident in which he was much bruised he remembers "squalling for a fortnight on being taken out of bed." In another place we read respecting an accident that "a huge dog had loitered behind, and suddenly discovered his master had driven ahead, and he, like a Leming rat, made straight for his master, quite regardless of our being in his way." Explain the reference to the Leming rat, and rewrite both quotations so as to make them express what you think that the author intended that they should.

(16) What is meant by "a rootless tooth"?

(17) When the number of digits differs on the front and hinder feet of a quadruped, which has usually the most?

(18) Amongst the principal divisions of the mammalian kingdom are Rodentia, Carnivora, Insectivora, Cheiroptera, Primates and Ungulata. Name an English representative of each.

(19) Why are Bees named Anthophila?

(20) Was Captain Cook killed at Owhyhee or in Hawaii?

(21) What do the figures 2123 mean when applied to the teeth, and how many teeth would the animal possess to which that formula would be suitable?

(22) At what time in the morning do Daisies open their flowers?

(23) In the *Times* of September 13, we read, respecting the Sakhalin coast, "The number of walruses and sea-beavers have been greatly reduced by the destructive methods of the American fishers." What animals are meant by the term "sea-beavers," and is the name a suitable one?

(24) If you have watched a stableman washing the wheels of a carriage, you will have seen him use an implement for lifting the vehicle from the ground. Why does he use it? What is its name? Explain its mechanism.

(25) If you pour hot water upon a dry sponge it will sink down to half its size, whereas if the water were cold it would swell up. Try the experiment and explain the different results.

(26) When a man's hands are cold he will swing his arms so as to strike the hands violently against the sides of his shoulders. What is this action called, and why is it practised?

NOTICES OF BOOKS RECEIVED.

Ornithology.—Messrs. West, Newman and Co., have recently published a very handy and useful "Pocket Book of British Birds," which we have much pleasure in recommending to field ornithologists. The arrangement followed is that given in Howard Saunders' well-known "Manual of British Birds." Species "of which only a few specimens have been observed or obtained in this country" are omitted. The notes are arranged under the heads of localities, haunts, observation, plumage, language, habits, food, nest, site, material, eggs. The size is very convenient for the pocket. Price, 2s. 6d.

The Transactions of the British Mycological Society for the season 1905 (published, May 19, 1906) contain a full account of the Fungus Foray held at Haslemere during the week ending September 30, 1905.

The specimens collected were exhibited in the Museum. The exhibition was a record one as regards the number of species, as no less than four hundred and eighty-five were

identified during the foray, including twenty-five mycetozoa. Four plates, three coloured, accompany the Transactions.

Amongst the species depicted we may mention *Polystictus montagnei*, a new British species found near Haslemere in 1898, and *Sparassis laminosa* (also a new British record) found by Mr. Douglas Taylor on the occasion of the Society's visit to Woolmer Forest on September 26, last.

Full particulars respecting the Society may be obtained of the Hon. Secretary, Carelton Rea, Esq., B.C.L., M.A., at 34, Foregate Street, Worcester.

DESCRIPTIONS OF MUSEUM SPECIMENS.

[*These descriptions are adapted for Museum Labels, and they may be had separately.*]

SKULL OF MONTJAC, OR BARKING DEER.

The skull of the little Montjac, or Barking deer, is of interest as showing better than any other the relation of the antler to its pedestal. The pedestal is very long and the antler very small. The latter usually possesses only two tines, the main one and a short stout one which grows near its base. From the front of the pedestal there runs a strong bony ridge down the outer border of the frontal bone as far as the junction with the nasal. This evidently gives strength to the prolonged and rather slender pedestal.

SKULL OF A LLAMA (Camel of America).

The skull of the Llama resembles that of the Camel, and both differ from those of the other ruminants in having incisor teeth in the upper jaw. "These teeth are placed at the side of the intermaxillary bone close to the canines, and agree with them in form" (Van der Hoven, vol. ii., 644).

"There are six incisors only in the lower jaw, and this jaw is undivided."

The camels and llamas form transition species between horses and oxen (ruminants and solid-ungulates).

THE HORNS OF A GNU.

The Gnu's horns are alike in both species and may be known at a glance by their hook-like curves. They pass outwards and downwards and then suddenly curve upwards and forwards. They resemble those of buffaloes and perhaps most closely those of the American bison. They are never very large, and always black. They are of fibrous structure and of large girth at their bases, emulating those of the buffaloes. The Gnu in some of its features resembles a little horse, possessing a mane and having its face, tail, and hindquarters much like those of a pony. It has, however, a cleft hoof and a beard which, as well as its horns, distinguish it from the horse family.

One of the gnus has a brindled neck and forequarters, pale streaks on a dark ground, and a black and tufted tail; another has a white tail covered with long hair from its base, and shows no brindling. The latter has an almost straight back, whilst the former stands higher in its forequarters like the bison. The horns of the brindled black-tailed gnu do not pass forwards nearly so much as those of the other.

All the Gnus are South African and would appear to bear the same relation to the buffaloes of that continent that the North American bison does to the American buffalo.

They are active but rather awkward animals, and their self-important airs are sometimes amusing.

THE SKULL OF THE DUGONG, OR HALICORE.

This animal is allied to the Manati, both belonging to the order *Sirenia*. They are water-living mammals. The dugong occurs only in Eastern and Australian seas, the manati on the coasts of South America and Africa. The grotesquely misshapen aspect of the skull of the dugong is due to the enormous development of the bones in its upper jaw which carry the cutting teeth (premaxillary bones and incisor teeth), and its clumsy lower jaw. The former bear a tusk in the male, which in the female is present but is never cut.

There are no canine teeth, and in the massive lower jaw no incisor teeth are ever cut. The rudiment of one is, however, present in the jaw. It may be noted that the bones carrying the upper incisors do not become united to those of the upper jaw. The back teeth (chewing teeth), are only four, five, or six in number in the dugong, whereas in the manati there may be twenty. A remarkable tendency to vary in their dentition is characteristic of this group of animals, and is no doubt in relation with differences in food. A recently extinct member of the family (Steller's sea-cow) had no teeth at all, but masticated the soft sea-weeds on which it fed by the aid of a horny palate (*Rhytina Stelleri*).

HEAD OF THE WART HOG (*Phacochœrus Æthiopicus*).

The Wart Hog is a native of Africa. His name makes reference to a pair of wart-like excresences, which are formed, one under each eye. These may be an inch and a half in length.

There is an enormous development of the base of the zygoma. The incisor teeth in the upper jaw are often wanting, and sometimes those in the lower also. The snout is short and square. The so-called warts are fleshy skin-growths and may be large enough to look like ears.

There is another Wart Hog (*Œliani*), met with in Abyssinia. It differs from the Cape Wart Hog in that its incisor teeth in both jaws are more persistent. It has two "warts."

THE SKULL OF A PIG (*Sus scrofa*).

The skulls of most of the swine family may be recognised by the long face, and the large size, in both jaws, of their dog-teeth or tusks. These are especially large in the male sex, and are often curiously curved, those of the upper jaw upwards, and those of the lower outwards and upwards. The incisor, or biting, teeth vary very much in different species and at different ages. They are often shed early, especially those of the upper jaw. In some pigs the lower incisors are

strong and slope directly forwards, as if for digging. The incisor teeth are of less service in the pig than in most animals, and are only exceptionally used for biting or grazing. The pig makes great use of the snout, and the nasal bones are strong and prominent. The molar teeth are well adapted for chewing, and are usually worn flat on their surfaces. Pigs champ but do not ruminate. They are, for the most part, root-eaters. The rim of the orbit is always imperfect. The normal dentition is three incisors, one canine, and seven molars in each jaw. If the upper canine is extracted the lower one will grow into a complete circle and reach the gum close to the root of the tooth. When thus curved it forms an ornament much valued in Fiji.

SKULL OF THE BABIRUSSA.

Note especially that the tusk of the upper jaw grows upward from the first. No part of it is directed into the mouth. This tusk is of extraordinary size, and it curves upwards so as to touch, and sometimes even to pierce, the skull. They are, as compared with those of other swine, slender tusks, more especially the under ones. The upper tusk grows through the skin of the upper lip. In old animals, when it is well curved, it must be useless as a weapon. It may serve to protect the eyes when the animal rushes through brushwood. In the female the tusks are small.

ANSWERS TO CORRESPONDENTS, &c.

CONCHOLOGIST.—Your shells are *Helix nemoralis* (immature), *Hyalinia* (*Vitrea*) *pura*, and *Buliminus obscurus*. *Vitrea pura* is a much smaller shell than *V. nitidula*, the latter may be distinguished from *V. radiatula* by the striæ not being continued from whorl to whorl. *B. obscurus* is much smaller than any member of the genus *Clausilia*. If you examine in May the trunks of beech trees growing on calcareous soils you will find *B. obscurus* and *Clausilia laminata* ascending them in large numbers to spend the summer aloft, coming down again in October to go into hybernation at the base of the trees

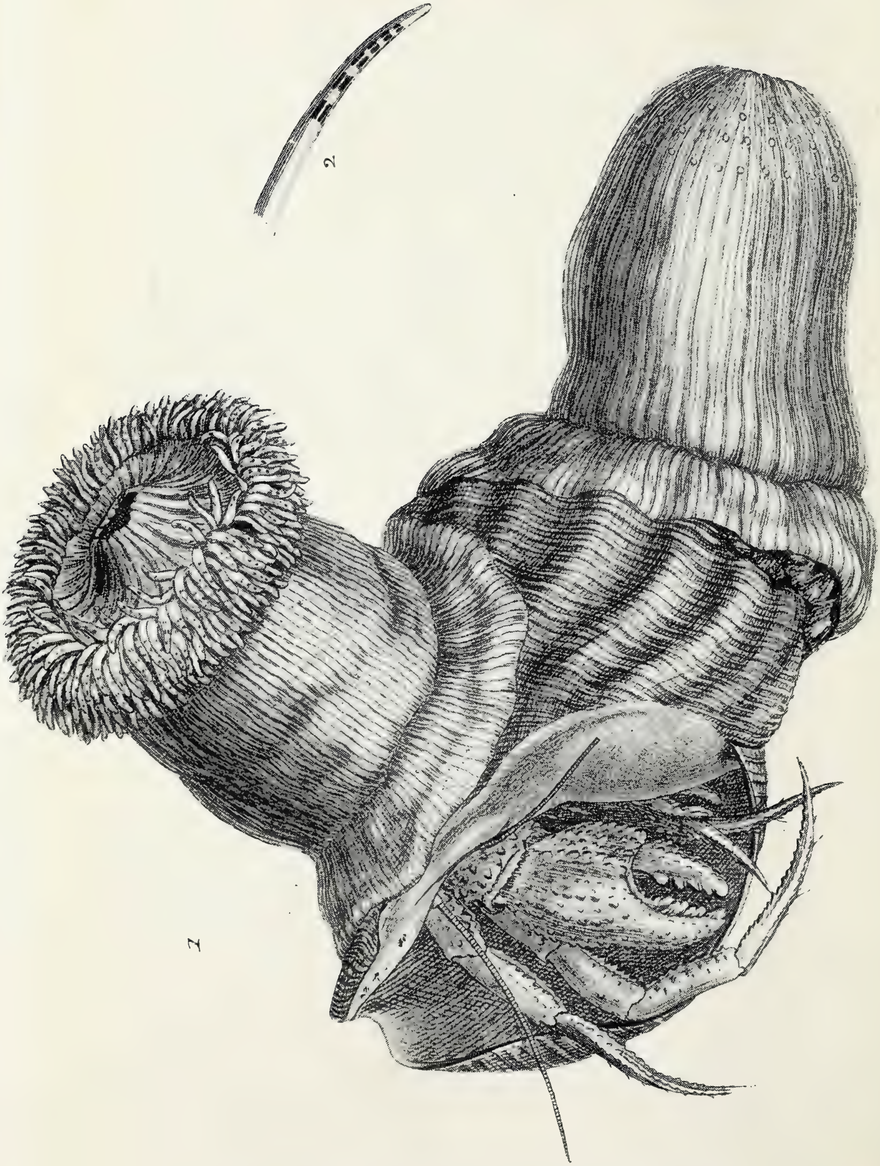
during the winter months. You will find *C. rugosa* (in modern terminology, *C. bidentata*) equally common on the trees, it is smaller and thinner than *C. laminata*. *B. obscurus* is a short, stout little shell, seldom exceeding 9 millimetres in height.

GARDENER. *Diseases of the Cultivated Chrysanthemum.*—At the present time three diseases are recorded for this country, viz., sclerotium disease (*Sclerotinia sclerotiorum*, Massee); corticium disease (*Peniophora chrysanthemi*, C. B. Plowright), and the only too familiar Rust (*Puccinia hieracii*, Mart). The sclerotium, which first appears as a white mould on the stem just above the ground, forms black lumps within the stem. The stem becomes very brittle and falls. From the black nodules in the following spring, small funnel-shaped brownish fungi with long, weak, dark stems appear. The spores from these settle upon dead organic matter, forming an abundant mycelium which ultimately attacks the base of the stems of chrysanthemums. It is said that fresh stable manure favours the spread of the disease. Diseased stems should be carefully collected and burnt.

The corticium disease also appears on the lower part of the stem, forming a white growth in autumn; Dr. Plowright, who first discovered it, says it resembles a splash of whitewash. It is not confined to the stems but extends into the adjacent soil. Diseased plants are shorter in height and thinner in the stem than healthy; they always die within the year. This disease has hitherto been observed only at King's Lynn in Norfolk, but it is very possible it occurs in other parts of the country. Dr. Plowright remarks that the only treatment is burning the diseased plant. It is useless to separate the apparently healthy shoots.

The well-known chrysanthemum rust first appeared in 1897, and spread with great rapidity in the very dry summer of 1898. The snuff-coloured uredo spores (summer form) are familiar to all cultivators of chrysanthemums. This fungus occurs on many wild plants of the order *Compositæ*, notably the hawk-weeds (*Hieracium*). All diseased plants should be burnt. The disease may be prevented by spraying the new leaves with potassium sulphide solution.

It is to be hoped that the chrysanthemum leaf blight (*Cylindrosporium chrysanthemii*), which has caused so much damage to cultivated plants in Ontario, Canada, will not find its way into this country. It forms large dark patches on the leaves, which turn yellow and hang down; the flower buds do not expand. It is stated that fungicides are useless.



Anemones on a Shell in which a Hermit Crab is lodged.

(*Actinia parasitica. From Johnston.*)

THE

MUSEUM GAZETTE.

No. 3. JULY, 1906. Vol. I.

REFORMED EDUCATION AT "THE GARDEN CITY."

Many will have learnt with pleasure that an effort is being made at the Letchworth Garden City to provide a "superior system of education." A paragraph in the *Times* which conveyed this information speaks of "an education as superior to that of ordinary schools as the garden city itself is intended to be to an ordinary town area," but, unfortunately, it gives no details. Some knowledge as to what the plans are by which this most desirable result is to be obtained would appear to be necessary if the appeal for funds is to be successful. A modest £500 is suggested, and the names of a very influential Advisory Committee are given. Still, we must ask what is the basal idea, what are the reforms contemplated? Experiments in education have been abundant of late and have been carried out with zeal and ability by men of high intelligence. We have schools of all kinds, and the profession of the teacher is rapidly obtaining a high and well-merited recognition on the part of the public. What is there of real novelty which is worthy to be attempted?

We may, perhaps, without being accused of presumption—since we only carry out the avowed object of our Journal as an advocate of objective education—venture to offer a suggestion. Have we not in this new City scheme a splendid

opportunity for realising on a larger scale than has yet been attempted the idea of an Educational Museum. Let the City Council construct and equip a large " Museum " which should contain, in the first place, all the appliances of a school—maps, globes, an orrery, models, portraits, busts and diagrams. In the second place, but scarcely secondary, should come collections well selected and well arranged, but not too extensive, of typical illustrations and specimens in most branches of natural history, and in some of science. Wherever suitable the " Space-for-time " method of arrangement and scheduled display should be adopted, since it affords to the pupil a ready clue to the appreciation of facts which it is very difficult to gather from books alone.

The buildings for such a Museum should be extensive, but they need not be costly. Long wooden sheds, all-but ground floor, would admirably serve the purpose, and might, with a little architectural ingenuity, be made sightly if not ornamental. Plenty of room is the main essential, and in connection with each gallery there should be a small lecture room, in order to admit of oral teaching on the spot. This would prevent interference of one class with another, for a main object would be that school teachers should find it advantageous to take their pupils to the museum for objective instruction, and that a brief lecture should precede or follow the inspection of specimens or maps.

There should, of course, be a Vivarium or shed devoted to the display of fresh botanical specimens and other living objects. Possibly even a miniature zoo, with its aviary and its rabbit hutches, might be feasible.

Such a museum would be an epitome of all that is contained in our great national collections in London and at our university cities. For the teachers' purposes it would be quite as good and in some respects much better than these, for by the selection and effective placing of the important, and the exclusion of the superfluous, it would avoid the distraction of attention which is to many unavoidable in these museums.

To take Portraits as an example, it would be easy to have a more representative and a more instructive collection than the invaluable one now displayed in our National Portrait Gallery.

We venture to regard the development of Objective Education—as distinct from mere book- or word-teaching—as the great educational reform of the future. It is the only plan which will enable teachers to keep up with the increasing demands upon them. It relieves the memory of the pupil by giving clear visualised impressions of things. Such impressions it is as difficult to forget as it is but too often difficult to remember those which have been acquired by merely verbal explanation. The sum of knowledge that is not only teachable but very desirable to be taught, increases every year, and it is becoming absolutely essential to devise improved methods for its mastery.

The advantages to the Garden City which might be expected to accrue from the possession of such a Museum would be many. It might become to some small extent a source of income; and it might also induce fathers of families to settle there for the benefit of their children. Chiefly, however, it would attract the proprietors of private schools to become residents in order to secure at small cost the advantages of a very liberal school equipment. Under the present scheme, which compels each proprietor to provide his own models, specimens, portraits, maps, &c., not only is much needless expense incurred, but the provision secured is but too often wholly inadequate.

We venture to commend our suggestion to the consideration of the Advisory Committee, and in doing so may add that it would not be needful to begin on a large scale provided only that land-space was reserved for future developments.

PLANT-LIFE IN LONDON SQUARES.

The Daisy.

We would invite those of our readers who are resident in London to make occasional botanical excursions in their Square gardens. Very interesting observations may often be made there.

At the present time the Daisy offers perhaps some of the most attractive. Allowing its leaves to lay very low, and producing its flowers with great rapidity, it defies the lawn-mower, and becomes beautifully conspicuous on the close-shorn turf. Being a "social flower," it occurs in patches, some large and some small, some round and some irregular. Everywhere they have been formed by aggressive spreading at their borders. Unlike what happens with the Fairy-ring fungi, its roots do not exhaust the soil, and it continues to flourish year after year on the spot on which it has succeeded in planting itself. It is not only social, but home-loving. Thus there are no rings or crescents or semicircles, but everywhere patches. Despite its reputed modesty, it is a self-assertive little plant, and soon succeeds in killing off most of its near neighbours. The plots become plots of daisies, and of nothing else.

It is next of interest to note the distribution of these Daisy plots. They do not occur everywhere, nor, if we look carefully, at random. Large areas of the grass are quite free from them. It will be seen at a glance that there are none under the trees. The daisy is a lover of the sun, and in this we have a clue to what might otherwise have seemed puzzling as to the cause of its absence on many large portions of the lawn which are not under trees. These are those that are in shade during the first half of the day. The Daisy is not a very early riser, and can do without sun until breakfast time, but it must have it before lunch. You will rarely find it growing on parts that do not get direct

sunshine before the afternoon. Thus, if you visit the garden in the late afternoon, you may easily find large tracts basking in sunlight, but yet quite daisyless. Look up at the trees and see how their shadows would be likely to have fallen in the morning; or, still better, get up in the morning and observe the facts with exactitude.

A few other points in connection with the Daisy may be worthy of observation. At what hour do its flowers open? Is the time definitely in connection with the exposure, or otherwise, to the early sun? Do the old and young flowers open at the same time? At what hour do the flowers shut? How many days does each flower last? What does a Daisy in seed look like? We will wager a good sum that not one in ten of our readers has ever seen a Daisy flower in seed, whereas all have seen Dandelions.

Lupins losing their Heads and dropping their Flowers.

Many of the plants which will flower fairly well in our London gardens are yet quite unable to produce seed. In connection with this inability some very interesting conditions are now to be observed in the Lupin.

Many of its flower stems now stand quite naked, and what is more, with one, two, or even several inches cut off from their tops. Yet the flower-spike of the lupin terminates, as everyone knows, in a tapering and very gracefully curving series of buds. Its bare truncated stems look exactly as if the gardener had been cutting them short, in, presumably, the hope that they would flower better on the lower part. It is possible, indeed, that we have a hint as to what he might wisely have done, but the fact is, that it is Nature's own work. The strength of the plant was over-taxed. It could no longer procure sap enough to supply all its buds, and so the topmost perished. This death of the head of the stem occurred whilst the flowers on the lower part were in full vigour, and it was, in a certain sense, for their benefit. Subsequently, however, it was found that the sacrifice availed

nothing, and one after the other, beginning with the lowest, the flowers and their rudimentary seed-pods perished too. This is the explanation of the naked flower-stems now so conspicuous and so disfiguring.

There is, however, a good deal of detail to be considered. One might have supposed that a starved plant, finding its means of subsistence inadequate to the production of all its flowers and of any of its seeds, would simply dwindle, or that it would fail to flower at all; but no, that is not the way in which Nature proceeds. The flowers of our London lupins are almost as beautiful as those of the country garden. It is only when the impossible is recogised as such that it is accepted. The battle is continued to the very last. Now and then, perhaps, it is rewarded with victory, and a seed-pod is perfected. We have not, however, in the Cavendish Square garden been able to find a single one. All the stems have lost their heads and dropped all their flowers. It is most important to note that the parts which have been abandoned have not been allowed simply to wither, they have been detached and dropped. The now quite useless flower-stem remains naked and solitary. The plant would appear to have a special aversion to retaining anything which is dead.

The process of detachment must be studied separately as regards the flower-spike and the individual flowers. It will be seen, if we examine a number of flower-spikes in full vigour, that in some, the very best included, the last whorls of buds have become brown and dry. In this we have an example of what has been called acro-sphacelus or "death of the point," a very common occurrence in cases where the supply of sap is feeble. The point is the part furthest from the root, and is naturally the first to perish in famine. In this instance a line of demarcation is very quickly formed, separation proceeds rapidly, and the end drops off. You may sometimes see a single fine flower produced just under the scar of the decollation, proving that the stalk remained vigorous.

So much for the death of the extremities; we have now to see what happens to the individual flowers which remain. These develop perfectly and in full colour, but when the stage comes at which the petals ought to fall and the seed-vessel to enlarge, the process fails. The seed-vessel is there, but the seeds are unable to attract enough sap to grow; and as cessation of growth is in this instance equivalent to death, the flower dies as a whole. It is possible that deficiency of insects may have prevented fecundation. Still, we have to ask, why should it fall off? The answer to this is, that it is shed by a process of detachment which begins, not in the dead flower, but in the living stem. It is one which is similar to that of shedding leaves. There appear to be two parts in the pedicle of the flower at which separation may occur. It never occurs in the middle of the footstalk. Either the flower may detach itself from its footstalk at the junction of its calyx, or the footstalk itself may be detached at its junction with the stem, with the flower still fixed to it. The latter is much the more common. It leaves the stem bare and simply rough with scars, whilst the other leaves it covered with headless footstalks a third of an inch long. It is a curious fact that no provision is made for separation at both places in the same flower. If you knock off a flower which is loosened at the junction of its footstalk with the stem—and this may often be done by the slightest touch—you will find that the dead flower will not detach itself from its footstalk without violence and tearing of the tissue. In this we have interesting proof that the separation is accomplished by the living and not by the dead, for the whole of the flower and its individual footstalk are quite dead.

A very important and interesting item in final proof that vigorous vitality and not decay or rotting, is the agency by which the separation of the non-living parts is effected, has yet to be stated. In some instances the top of the flower-spike dies and withers but remains firmly fixed. In the same stems it

will often be seen that the flower pedicles have also remained. On looking further and comparing them with others it will always be noticed that these stems are thinner and less vigorous than their companions. It is the sickly plants which can neither cut off their tops nor detach their flowers at the footstalk, the strong ones which can and do these things.

THE TIDES.

It were well worth the trouble of a visit to the seaside were there no other object than that of observing the wonderful phenomena of the Tides. We all know that these are brought about through the influence of the Moon and Sun, but not improbably many of us have to get rid of certain misconceptions before we can understand the reality. The water which comes creeping or dashing up round the child's sand castle is not drawn there by the moon's attraction acting simply as a magnet might act on a toy swan. It does not leave, for instance, one side of the North Sea or of the Atlantic in order to swell up on the other and then return. Quite otherwise, the movements of the surface of the water are the result of a deep ground swell which has travelled from far and in which the almost measureless depths of the oceans were involved. You can no more have tides in small masses of water than you can have tempests in teacups. The moon declines to exert her power on small achievements. To translate this into the language of science the force of attraction, although always present, becomes manifest only when very large bodies are concerned. It is then where the ocean is of almost measureless extent and some miles in depth that the attraction of the moon causes movement and that the force is originated which results in the tides. The earth rotates on its axis under the sun and moon and the attraction

of these masses of matter causes the movable parts of its surface, *i.e.*, the water, to move. Not that the water really makes any change of place excepting in its most superficial parts, but it is, so to speak, swayed about in a manner which makes its uppermost layers change their position. Thus the tides, as observed at any given place, may be said to be driven up by distant deep propulsion rather than drawn up by influence directly from above. A clear perception of this fact will simplify much, but there will still remain details for the comprehension of which close attention will be required.

It is customary to say that the southern hemisphere, and especially the ocean between South America and New Zealand, is the "Cradle of the Tides." By this expression is meant that it is from this region that the great deep sea movements may be said successively to start. From this point the swell passes westwards and to the north. The course taken by the swelling of the water is, as may readily be supposed, modified locally by the formation of the land, but the force is everywhere the same, and it is the continued attraction of the moon, augmented in some seasons, hindered in others by that of the sun.

The ground swell which has started as suggested near New Zealand, is under the same influences augmented in its course, and finally after a prolonged interval is felt in the north Atlantic, and reaches our British shores. The promontory of Cornwall serves to divide the flow and to send one part north by the Irish sea and west coast of Scotland to turn the Orkneys and descend on the east. Another portion diverted eastwards flows up the English channel, and the two may meet and neutralise each other in the straits of Dover. Thus it will easily be seen that the tide will rise up sooner on the south coast of England than on the north and sooner on the west than on the east. These are the main features, but there is much yet to be explained.

In some localities on our southern coasts where these diverging streams again meet, great complications result in

the times and character of their tides—four distinct high tides occurring in some places in each day.

To speak accurately, there are not two tides in every day. A longer period than twenty-four hours is required for the completion of two tides. From one high water to another the exact time is twelve hours and twenty-five minutes, and as this occurs twice daily there must be an interval of fifty minutes between the high water tide of one morning or evening and that of nearly the same time on the following day.

The two tides occur in each *lunar* day, but as that day is about fifty minutes longer than the *solar* or *civil* day, high tides occur, as has just been said, on each successive *civil* day about fifty minutes later than the corresponding ones on the previous day.

The range as to the rise and fall of the tide is estimated at most places on our coasts by the extent of beach which is laid bare at low tide and that covered at high water. In narrow rivers and on coasts where the cliffs are precipitous the measure mostly is simply of depth. When the tides are good the depth may exceed twenty feet, but it varies much at different places. When, under the influence of the moon and sun acting together, the tides are good for several days in succession they are called "spring tides," and when the converse happens and they are poor for several days they are called "neap." A neap tide neither comes up far nor goes down far, whilst a spring tide exceeds in both directions. Spring tides and neap tides alternate regularly and both occur twice in the lunar month. The tides are good or "spring" during the days following New and Full moon, and they are "neap" at the middle periods between these events.

When you get to the seaside consult your almanac and take a slip of paper and record the dates of the full and new moon for the whole of your visit. You will then be able to note down also the times when the tides will be good and when poor, and subsequently to see whether your predictions are fulfilled.

It must, however, be stated beforehand that your almanack or a local tide-table will show you that high tide by no means exactly coincides with the arrival of the moon on the meridian. In preparing these tables astronomical data can furnish the time at which on each day the moon will cross the meridian, and also the position of the sun at that time relative to the earth and moon. There are, however, other conditions—such as the conformation of the coast line and the depth and character of the bed of the sea, round and over which the tide travels—which must be taken into account before any correct calculation can be accomplished. But—to say nothing of their intricacy—many of these conditions are beyond our ken, and cannot, therefore, be brought into calculation. The only resource left is to note empirically, on the spot, what interval actually elapses between the occurrence of the moon on the meridian and the arrival of high tide. The difference thus ascertained is then allowed for in the local table, and this allowance is called the "Establishment of the Port." You may by observation "establish the port" for the place where you chance to be staying.

We are writing of Tides as they may be observed on the sea coast. If we pass up an estuary such as that of the Humber, which gradually narrows to a river, certain important differences will be noted and these become greater if we ascend the rivers themselves. On the open coast the tide rises slowly and it needs close looking to tell when its rise begins. This is because there are no impediments. The banks of the estuary or river by narrowing the stream constitute an impediment which increases the higher you go. Thus the beginning of the tidal flow is retarded until the force of the risen ocean having accumulated drives up the water with considerable and sudden impetus. Thus the beginning of the rise of the tide at Cleethorpes, Grimsby or Spurn Point, will be very gradual, but at Goole or Selby sudden and violent. At these places a sort of wave, or wall of water, rushes up the river which may break ships from their moorings or even

it is said sometimes lift a small boat and throw it upon the deck of the barge in front of it. To this sudden rise—experienced chiefly at spring tides and in narrow but deep tidal rivers—the name of "bore" or "ager" is given. In some places, in order to prevent damage, it is customary for those down stream to raise the cry "Ware ager" for the benefit of those higher up, who at once look to their mooring ropes, or if in movement, to their rudders.

Remembering that the moon passes over the earth's surface once only in a day, it may seem puzzling why there should occur two tides. What we have said as to the influence of the moon being exerted on large masses of water rather than superficially, may here again help the reader's conception of the facts. The entire mass of the globe, solid as well as fluid, comes under the influence of lunar attraction, but it is the fluid which alone can move its place. Thus when the tide rises, the solid earth as well as the water is influenced, whilst the water alone is seen to respond. The effect of the earth's movement is, however, felt on the opposite side of the globe. The land is, so to speak, drawn away from the water and the latter is left to heap itself up and constitute a tide. Thus it is high water at the same time on opposite parts of the planet and on both sides twice a day. It may perhaps be suggested by some thoughtful reader that if one tide be the result of direct attraction of the water from the earth, and the other of the attraction of the earth from the water, it is scarcely probable that they would be exactly alike in strength. Nor in truth are they; every alternate tide is slightly weaker than its companions.

When reading about the tides the reader should have at hand a small globe.* He may advantageously make observations on the mass movements of water in any large vessel in

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* A small globe should be part of the equipment of every student. Very neat ones mounted on stand and with a case for protection, may be had of Messrs. Philips, in the Strand, and probably of many others, for the sum of eighteenpence.

which a few bricks have been variously arranged. He will then easily realise how local conditions, impediments, &c., may influence the direction of the water and will readily understand that the tidal strength may vary greatly in different places. We have but dealt with the surface of the subject. There is a great mass of detail, to some of which we may recur at a future time. It will be something, however, if we have succeeded in correcting the very common misapprehension that the tide is merely a surface movement under the direct attraction of the moon and have substituted for it the conception of a vast mass of deep water which exercises a propulsive force upon the shallower.

THE HUMBER AND THE NILE.

It may seem a long step from the Nile to the Humber. These two rivers, have, however, one curious feature in common. The waters of both are, under certain conditions, laden with mud, and are systematically used by farmers who live on their banks, not for the sake of their water, but for that of their mud. The methods adopted are not very dissimilar. The Yorkshire farmer cuts deep trenches through the river banks, and, having guarded them by strong wooden gates—"cleughs," as they are called—he lets the water in over his fields and allows it to settle. Usually the cleared water flows out again with the falling tide, but if wished it may be impounded. It is said that a twelve inch glass filled with Ouse or Trent water in good condition, will deposit an inch of yellowish mud; not sand, but clay. Thus it is not difficult, by taking several tides, to raise the level of a field by several inches. The process is locally known as "warping," "warp" being the name for river silt. The warp thus obtained grows magnificent crops, not perhaps to compete with those of the black mud of the Nile, but still very good indeed.

There are, however, important differences between the

Egyptian and the Yorkshire river. In the former there are no tides and in the latter the tidal flow, twice every day, is very strong. The mud of the Nile is brought down from the lake and high lands of its source, and is constantly being carried downwards to its mouth. At the latter an immense delta of mud has been and still is being formed. The Humber is not forming any delta, and, as a matter of fact, its water loses its treasure before it reaches the estuary. At the latter it is quite clear, whereas at Selby, the Ouse, which is continuous with it, is almost as thick as pea soup. It is not, indeed, the Humber itself which is mud-laden, but its tributaries, the Ouse, the Trent, and the Derwent. Nor does the mud come from the inland sources of these rivers. The streams in the beautiful Yorkshire dales are clear enough except, perhaps, for a brown tinge of peat. It is only certain middle portions of the rivers we have named which carry available mud. There is none where they come from and they lose it all before they get to the sea. The farmer who wishes to warp his field does not congratulate himself, as does his Egyptian brother, on exceptionally high water, but provided only that the water rises high enough to flood his land, prefers a moderate one. When the river is very full, the water is thin and comparatively valueless.

It has been to some writers a difficult problem as to where the mud comes from. There need, however, be no mystery about it. The rivers make it themselves. They are amongst the most hotly tidal rivers in Britain. The water, at rise of tide, rushes up them with great force. As a result their curves are contantly altering; land is torn away from one side and laid down, in the form of silt, on the other. This has been going on for ages, and the rivers now flow through valleys perfectly level, which consist of deposited mud. If they had rocky borders they would flow clear enough, but they run between mud banks which they are constantly tearing away. What wonder that the water in these districts becomes muddy. This is, we fear, rather a commonplace ending to an ambitious comparison, but it is the truth, and cannot be helped.

SEASIDE NATURAL HISTORY.

No. I.—Sea Anemone and Hermit Crab.

Our frontispiece (copied from Johnston) illustrates in one picture two of the many very curious life habits which have been acquired by some of the lower animals. A hermit crab is shown in possession of a large shell as its house, and upon the outside of this house two large sea anemones have planted themselves. This partnership possession of stolen property is not only not unusual, but it is the ordinary course of life of the two animals. The hermit crab (*Pagurus*) has, in the first place, been so long in the habit of taking an empty shell for its home that its own structure has become modified, and the hinder parts of its body are now soft, and unprotected by the shelly armour common to its species. The anemone, on its part, has acquired such a strong preference for a shell which can travel about that it is rarely found in any other position. Its habit has earned for it the name of parasite. It is the Sagartia or Actinia parasitica of zoologists. Sometimes it is found on an empty shell and sometimes on a fixed stone, but these locations are exceptional. The crab carries its shell about with it, and the anemone apparently enjoys riding. It is quite probable that the companions are of advantage to each other. The anemones undoubtedly serve the crab's purpose in concealing his dwelling-place. The anemones may also obtain food from what the crab rejects. It is believed that crabs will seek the anemones and endeavour to get them placed on their shells. It is quite certain the crab never molests the anemone, whilst very often, when small, the latter is attached close to the lip of the shell. Of this latter position illustrations are given in the "Guide to the Naples Aquarium," where living specimens may always be seen. Mr. G. B. Sowerby, in his "Popular History of the Aquarium," gives a coloured figure in his plate xi., and at page 104 writes: "He (the anemone) usually chooses a Buccinum inhabited by

the Pagurus Bernhardus, or Hermit Crab, which blunders along among stones, rocks, and seaweeds with his double burden, the uppermost of which does not seem daunted by the dangers of his passage. The anemone generally keeps his disc expanded when he receives a concussion which would make most of his brethren hide their diminished heads."

Fig. II. This plate represents one of the tentacles of the anemone magnified.

This anemone throws out with great readiness the long adhesive threads which characterise its genus, and they appear to be particularly adhesive and injurious (Sowerby). By their means little fish may be killed. Fish so taken may serve as food for the crab.

Actinia parasitica is a large anemone, sometimes attaining the height of three or four inches without contracting its column in girth. In Dr. Johnston's plate it is shown of natural size. It is not one of the most beautiful, its skin being of a sandy-greyish colour and warty. It has lengthwise stripes of brown or purple.

No. II.—The Lobster Horn.

This illustration is copied from another of the beautiful plates in Dr. Johnston's British Zoophytes (plate xix.). Its central object is a representation of the "Lobster Horn" (*Antennularia antennina*) one of the finest of the Hydra-medusæ. Its name is taken from the resemblance of its branches to the antennæ or horns of the lobster. These horns are but seldom branched. They are often six or eight inches long. Although so plant-like in its mode of fixation and growth, this curious structure is, like others of its class, an associated colony of animal polypes. These polypes are of two kinds; the one, hydra-form, smaller, and more numerous, remain attached, whilst the other, medusa-form and much larger, develop into free swimming medusæ or jelly-balls. Both kinds are shown in the magnified portion which constitutes Figure III. In this

Fig. 1.—Antennularia antennina, *natural size.*
Fig. 2.—Antennularia ramosa, a fragment of a specimen, *natural size.*
Fig. 3.—A portion of the Antennularia antennina, *magnified.*
(*From Johnston.*)

Alcyonium digitatum.

(From Johnston.)

the large "vesicles" or medusa-forming cells are easily distinguished from the others. The *Antennularia antennina* may be found on most parts of the British coast, but usually only in broken fragments. It grows in clusters, and has as fixation-roots a number of brown tubular fibres which become matted together over fragments of shell or sand. It is often attached to stones or large shells.

Figure II. shows a portion of another species of Antennularia, the polypidom or stem of which is branched (*A. hanusa*). It is as common as the other.

Those interested in the development and anatomy of these polypes will find an excellent article from the pen of Professor Ray Lancaster in the twelfth vol. of *Encyclopædia Britannica*, p. 55.

No. III.—Dead Men's Fingers.

This plate is a reproduction of the 34th in Johnston's beautiful monograph on British Zoophytes. It represents, in the perfection of its living and expanded state, a structure which is very common on the sea-shore almost everywhere, and which, when shut up and dead, is almost loathsome. It has received several somewhat opprobrious names, being known to the fishermen as cow's-paps, dead men's fingers, &c. As picked up on the shore, it usually presents the appearance of a piece of sodden orange-peel. To see it in its beauty and as shown in our plate, a living specimen must be obtained and placed in a pan with fresh sea-water. Under such conditions, after a little rest, it will expand; from every pore an eight-tentacled polype will protrude itself, and a sight not easily forgotten will be presented.

The *Alcyonium digitatum* belongs to the hollow-bodied animals (*Celenterata)* and to the family of Corals. Of this family the Sea Anemone may be taken as a type. The term Anthozoa, or Flower-animals, is also frequently and not inappropriately applied to them. In the present instance each flower may be regarded as a minute Sea Anemone, living

in close company with others on a thick flesh-stalk. True Sea Anemones are usually single, each one being attached to a stone, or rock, or shell by its own foot. In the Alcyonium the foot or stalk which fixes the colony to the rock is one common to the whole. The difference is parallel with that between a simple and a compound flower. The Sea Anemone parallels a crocus; the Alcyonium a sunflower. This similarity, however, shows only that in the animal and vegetable kingdoms similar varieties in the modes of growth may be met with, for there is not the slightest doubt that these "animal-flowers" are really animals.

The structure upon which the polypes are supported is termed the polypes' mass, or polypidum. It is covered by a leathery skin, which is roughened over by its stellated pores like orange-peel. In its substance it is jelly-like or spongy, and netted by tubular fibres and canals which communicate with the polype-cells.

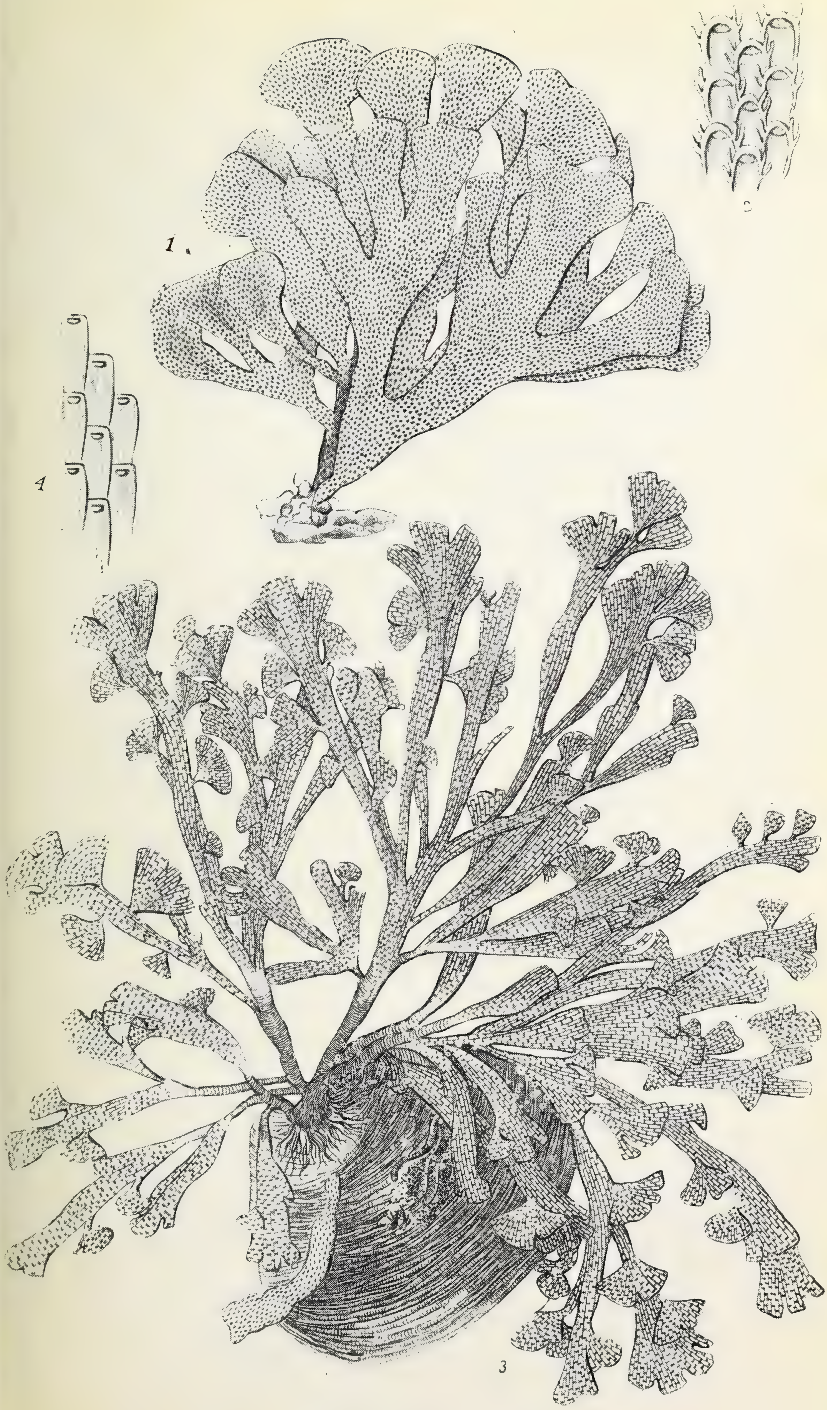
On many parts of the coast it is so common that scarcely a stone or shell is dredged which does not show some of it. Sometimes its growth forms only a thin encrustation, but more usually it rises up in lobes or finger-like masses of various and very irregular shapes. If the stellate pores are attentively examined they will be seen to be marked by eight rays, indicating the number of tentacula of the polype.

We have noted that these Alcyoniums are classed with corals. They never form any real coral structure, that is, they never convert themselves, or their stalks, into stone. Spiculæ of a cystalline stony nature are, however, developed in them at the roots of the tentacula, which they strengthen. In this tendency to secrete lime into their substance they exhibit the same proclivity which in many other corals produces the well-known stony structures.

No. IV.—The Sea Mats.

The term "zoophyte" means animal-plant, but phytozoon, or plant-like animal, would be a better one.

The species here depicted belong to the Polyzoa or Bryozoa;



The Sea Mat.

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a group of animals which form colonies, and are, for the most part, fixed. They are often spoken of as moss-animals. Some of the marine forms bear a remarkable resemblance to seaweed, and are often mistaken for plants by visitors to the seaside. Examination of a "leaf" quickly reveals the difference between it and a true seaweed.

The observer can easily make out, with the help of a pocket lens, the numerous cells which closely stud each side of a "leaf." The mouths of these cells vary according to the species, a lip is present in some, *e.g.*, in the Phylactolæmata, which are chiefly fresh-water forms; the mouth has a tongue-shaped lip.

The Chilostomata, or lip-mouthed Bryozoa, include the sea-mats (Flustra, from the Saxon *flustrian*, to weave). Two species are represented in the plate. Fig. 1, *Flustra foliacea*, popularly termed "Broad-leaved Hornwrack." It is brown, and has a peculiar smell, variously described as "fishy," or resembling "violets," "oranges," or "verbena."

Fig. 2, nine cells of the above, magnified to show the lip-like lid and the scattered marginal denticles. The lid is elastic, and serves as a covering for the delicate and soft tentacles.

Fig. 3. The polypidom, or stock of *Flustra truncata* L., (= *Flustra securifrons*, Pallas; Pennington's British Zoophytes p. 237), the "Narrow-leaved Hornwrack" of Ellis. The linear-oblong cells with smooth margins are shown in fig. 4. According to Johnston this species occurs "in deep water. Very common on the shores of Scotland and of the North of England. In the South it seems to be rare."

The moss animals are remarkable in their many methods of reproduction. The sexual method and multiplication is by budding in the marine forms; the fresh-water species reproduce themselves by winter buds and statoblasts.

No. V.—The Bottle-brush Coralline.

This plate, like the preceding ones, is taken from "Johnston's British Zoophytes" (plates xvii. and xviii.). It depicts the "Bottle-brush Coralline," *Thuiaria thuja*.

Fig. 1 shows stocks, natural size, growing on a cockle shell. The branches are dichotomous, and arranged in whorls round the stem, four to a whorl.

This zoophyte is very distinct in its "bottle-brush" appearance; the lower branches decay and fall away, fresh ones being produced at the apex.

Fig. 2 represents a magnified portion of the branch. Note the alternate cells arranged in two rows and closely pressed to the stem, and the pear-shaped vesicles.

Fig. 3 shows the young condition of the polypidom magnified about four times.

No. VI.—Sea-fans and Sea-shrubs (Gorgonidæ).

Amongst the beautiful objects to be found in all museums, and also in many drawing-room collections, are the Sea-fans. These structures, which are often a foot and a half or two feet in height and the same in breadth, present a network of branches, a stem, and a root. It is exceedingly difficult to the observer to think otherwise than that they are plants. Yet it is quite certain that they are the framework upon which have lived colonies of polypes, and that these polypes are of animal nature. They belong in fact to the family of Corals.

In many specimens the network arrangement is much more developed than that shown in the illustrations which we here copy from Dr. Johnston's work. Many of these fans are quite flat, and look as if they might serve well for the purpose implied by their name. Others, however, grow in a more tree-like manner, resembling what is gathered on the coast as "samphire." To these the name of "Sea-shrubs" is often given. The Alcyonarids, "Cow's Paps," or "Dead Men's Fingers," are their near allies. (See previous plate and page 85.)

The network arrangement is due to the tendency to branch out on the flat in all directions, and for the branches to coalesce wherever they touch each other. As seen in museums these structures vary in colour from a deep orange red to yellow or a dirty white. They present a roughened, almost crumbling

Sea-Fans and Sea-Shrubs (Gorgonidæ).

surface, as if crusted with dried ochreous plaster. This crust represents that which in the living state was a soft fleshy substance in which the individual polypes were embedded, with power to extrude themselves and to again retire. It constitutes a sort of bark (cortex) to the coral-stem, and is technically known as the cœnosarc. The central stem upon which this cœnosarc is expanded is called the sclerobasis. The common red and black coral of the shops is a sclerobasis from which the enveloping cœnosarc has been wholly removed. The meaning of the word cœnosarc (literally common-flesh) is a flesh which, for purposes of nutrition, the polypes share in common; they feed together, and they jointly contribute to the nutritive juices which circulate in it. Thus we have a most curious instance of a number of animals living in a sort of partnership or compound body. They are not only supported on the same stem, but they share in nutrition much as the buds on a tree share in its sap, and contribute to the elaboration of that sap. We cannot wonder that the term Zoophyte, or plant-animal, was for long claimed as appropriate to these structures. Their roots, however, are different from those of most plants in that they do not take up anything, but serve only for fixation. Other features also definitely mark them out as animals. They are usually attached to some foreign body.

The Sea-Fans were formerly known as Gorgonias, and are still classed with certain other corals under the family name of GORGONIDÆ. The name Gorgon is somewhat far-fetched, and was originally applied because their stems were supposed to resemble the snaky hair of the Fury. For popular use the name Gorgon-corals might perhaps be suitable, and would tend to fix in the mind their true nature. The Sea-Fan most usually encountered in museums is the *Gorgonia flabellum*, or *Flabellum veneris*. It has been found accidentally on the British shore, but is not a native.

The *Primnoa lepadificea* is a species of Gorgon coral which grows on the Shetland and Norwegian coasts (Gulf Stream), and is usually about two feet high, and is reputed sometimes to

attain the size of a tree, and to be of strength sufficient to tear the fishermen's nets. All the Gorgonidæ grow in deep water.

The Gorgon-corals belong to the order Alcyonaria, and their individual polypes are characterised by eight tentacles (*octocoralla*) which are fringed on their sides. These vary as to sex, and sometimes both sexes occur on the same stem; at others one sex is found alone on the stem. Thus we have a parallel with monœcious and diœcious plants.

No. VII.—The Sea-Cypress.

This plate represents an object which will be recognised at once by almost all our readers—one of the so-called "Corallines" so commonly seen at the seaside growing on oyster-shells and the like. There are many species of them, and the one here given is that known as the Sea Cypress (*Sertularia cupressina*). The central figure (fig. 1) represents a coralline with its branches, &c., of natural size, and on both sides of it are seen portions of it moderately magnified (fig. 2). This latter is seen to be a stem with joints and side branches. Both stem and branches are covered with little cups showing spine-like teeth at their edges. These cups are found on both sides of both stems and branches. On the upper surfaces of some of the branches (on the right hand of the plate), are shown structures like little urns, each with a footstalk, which curves downwards to pass into one of the cups. A careful inspection of fig. 1 (natural size) will make it evident that in this also the urns are shown, and that they do not occur on all the branches.

This beautiful structure, although looking so much like a plant, is not a vegetable, nor does it approach so nearly to one as to deserve the name of "zoophyte." It consists of animals of simple organisation, and living in society, that is, in a colony. To each separate animal (one for each cup) the name polype is applicable, and the stem with its branches upon which the polypes are borne, is the polypidom. The

A Coralline.

individuals inhabiting the cups—to use the language of zoologists, "the persons"—are of two different forms. The large majority of them form polypes not much unlike those which build coral, and closely allied to the common freshwater Hydra. They do not grow beyond a certain small size, and as a rule live out their lives on the stem where they were born. A far different destiny awaits the minority, the large flask-shaped bodies. These, when well-grown, break off from the parent stem, swim free in the water, swell themselves by the formation beneath their skins of an enormous quantity of glass-like jelly, acquire complex organs, and, in fact, become Medusoids, or *Swimming Bells.* The whole process of their wonderful transformation is one of great detail and intricacy, and we shall have much to say about it in the future. For the present we trust that we have said enough to show that it is of surpassing interest, and at the same time to make our plate intelligible.

It is, perhaps, desirable to add that the term "Coralline" is a popular and not a scientific one. It has until recently been allowed to include all structures allied to that now under consideration. Of late, however, it has been claimed by botanists (perhaps unfortunately) for a single group of calcareous seaweeds.

Gosse on the Shore-Beetle.

From Gosse's "Ocean," p. 23.

"Our own shores swarm with little creatures of many kinds, some so small as to escape the eye of any one but a naturalist, which yet are well worthy of being examined and studied. Take one example. Walking along a sea-beach where the loose shingle rattles under the retiring waves, we may find a minute beetle known to entomologists by the name of *Aëpus fulvescens*, whose habits may well excite our astonishment. Formed, like all other beetles, to breathe air alone, it deserts the haunts of its fellows and betakes itself to the sea, choosing to dwell among the pebbles so low down on the beach that the water covers it constantly, except for

a day or two twice every month, when, at the lowest ebb of the spring-tide, it is for a few minutes exposed. Now, during the weeks of its submersion, how does this little creature breathe? Oxygen it must have or it will assuredly die. Many of the beetles that shoot hither and thither in our fresh-water ponds are clothed with a coat of thick but very fine down in which air is entangled and carried beneath the surface. But our little Aëpus is not furnished with a coat of down. If we examine it, however, with a magnifier we shall discover that its whole body and limbs are studded with long, slender hairs, and when it plunges under water, each of these hairs carries with it a little globule of air from the atmosphere, and these uniting, form a bubble of air surrounding the body of the insect and serving it for respiration. But, subjected to the rolling of the tide, it would be liable to be perpetually washed away from its dwelling-place were there not an especial provision graciously made for its stability. For this end the feet are furnished with claws of unusual size, to cling firmly to the projections of the stones, and in addition to these the last joint but one of the feet has a long, curved spine meeting the claws, giving it an extraordinary power in grasping, as well as aiding it in obtaining its prey. In other respects, with regard to its eyes, its antennæ, its jaws, we shall find, if we carefully examine it, that, minute as it is, being scarcely an eighth of an inch long, its wants have been accurately remembered and well supplied."

On Shore Collecting.

Major Elwes, of Babbacombe, wrote last year in the "Torquay Directory," a very interesting paper on shore collecting. He remarked that—

"There are three principal methods of obtaining marine animals for scientific purposes. Those which live in deep water can, of course, be obtained only by dredging. Those which swim in the upper part of the sea, or near the surface,

must be captured by means of a tow net from a boat. Thirdly, those which live between the limits of low and high tides can be taken in various ways at low water. The best time for adopting the latter course is at spring tides. On this coast the spring low tides always occur in the middle of the day. This fact has the advantage of giving good light, and success in shore-hunting very much depends upon the light. But although spring tides are the best, and many specimens can only be obtained at such times, much can be done without waiting even for an ordinary low tide. The subject of marine insects has been very little studied. It affords a fine field for investigation for any entomologist desirous of working a little out of the beaten path.

"Beginners at shore-hunting are nearly always disappointed with the results. They read Gosse and Kingsley, and they go down to the shore with the idea that every pool into which they look will be as full of anemones, hydroid zoophytes, and all sorts of things as a well-stocked tank in an aquarium. Another cause of disappointment is that they fail to realise how very small many of the animals about which they have been reading are. The drawings they have seen have been highly magnified, and they forget the size of the actual creatures. It is always advisable to take home likely-looking weeds and stones, and, after placing them in shallow dishes, search over them with a pocket lens. It is in this way that many of the best finds are made."

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A great variety of animals classified as Crustaceans occur at the seaside. Crabs, lobsters, shrimps, prawns, king crabs, barnacles, acorn shells, woodlice, &c., belong to this order. They all have a shelly crust which protects the body, and jointed limbs in pairs (five to seven). They all pass through a series of changes before reaching the adult form.

By far the best manual on Crustacea is that by the Rev. T. R. R. Stebbing, published by Kegan, Paul & Co. 5s.

COMMON SEA-SIDE PLANTS.

The following is a descriptive list of the most widely distributed of British sea-side plants, seventeen in number. All occur in more than 50 of the 112 vice-counties. For a more detailed list of our coast plants the reader may be referred to pages 551-557 of the "Home University."

These descriptions have been prepared specially to serve as labels in the vivarium and herbarium, and may be had separately.

Sea Milkwort (*Glaux maritima*).

From *glaukos*, "grey," in allusion to the colour of the leaves. Salt-wort, from its Latin name *salicornia*, "salt horn." Flowers small, pale pink. Calyx deeply five-lobed. Distinguished from all other members of the order by the absence of any real corolla, the calyx assuming the appearance of one. (*Primulaceæ.*)

Stone-crop (*Sedum anglicum*).

From *sedere*, "to sit"; the plants are found growing upon stones, rocks, walls, and roofs of houses. *Crop*, a top, a bunch of flowers. Flowers white, occasionally tinged with pink, in a short, irregular cyme. Sepals five, short and green. A small perennial, seldom more than three inches; entirely glabrous. (*Crassulaceæ.*)

Scurvy Grass (*Cochlearia officinalis*).

From *cochlear*, "a spoon"; the leaves are hollowed like the bowl of a spoon. Scurvy grass, from its use against scurvy. Calyx of four egg-shaped, concave, spreading leaves. Flowers white, in numerous corymbose clusters. Stem angular, smooth and shining, branched. (*Cruciferæ.*)

Sea Beet (*Beta maritima*).

Beta, from the Celtic *bett*, signifying red; alluding to the red colour of the roots. Beet, L. *beta*, the seed resembling

the second letter of the Greek alphabet. Flowers green, single or clustered, in loose, long, terminal spikes, often branching into a leafy panicle. The white and red Beets, and the Mangel Wurzel (root of scarcity) are cultivated varieties of this species. (*Chenopodiaceæ.*)

GLASS-WORT (*Salicornia herbacea*).

Generic name from *sal*, "salt," and *cornus*, "a horn." *Herbaceus*, "grassy." Glass-wort from furnishing ashes for glass-making. Flowers forming terminal, succulent, cylindrical spikes. The style is included in the succulent perianth, and divided into two or three stigmas. Leaves none. (*Chenopodiaceæ.*)

SEA PINK (*Armeria maritima*).

Armeria, the Latin name for Sweet William. Also called Thrift, which is the passive particle of "threave" or "thrive," to press close together. Flowering stems simple, from three to eight inches high, each bearing a globular head of pink or sometimes white flowers. Leaves narrow-linear, with a single prominent mid-rib. (*Plumbagineæ.*)

SEA CAMPION (*Silene maritima*).

From *sialon*, "saliva," in allusion to the viscid moisture on the stalks of many of the species, by which the smaller kinds of flies are entrapped; hence also the English name of the genus, Catchfly. Flowers white, almost solitary. It very much resembles the campion of the fields and roadsides, but differs in the shorter stem, more obtuse leaves, and the larger scales on the petals. (*Caryophylleæ.*)

SEA PURSLANE (*Arenaria peploides*).

Arena, "sand," in reference to the sandy soil on which it grows. Purslane is Italian *porcellana*, a name applied by Marco Polo to some fine earthenware made in China, and adopted from the name of a sea-shell, which it resembled in texture. Flowers few, on short pedicels. Sepals five.

Petals scarcely longer. The large and nearly globular capsule opens in three or four broad valves. (*Caryophylleæ.*)

Sea Pearlwort (*Sagina maritima*).

From *sagina*, "fatness"; presumed nourishing qualities for sheep. Pearlwort from its being used to kill a disease in the eye called pearl. Sepals, stamens, and styles usually four. Petals as many or none. Closely allied to the common Pearlwort, and presenting the usual maritime differences of firmer and thicker stems and leaves. (*Caryophylleæ*).

Sea Aster (*Aster Tripolium*).

From *aster*, "a star"; the flowers resemble little stars from the rays of their circumference. Perennial, not more than a foot high, seldom branched. Leaves linear, entire; somewhat succulent. Flower-heads in a terminal compact corymb. Ray-florets purplish, numerous or few, sometimes absent. (*Compositæ*).

Sea Holly (*Eryngium maritimum*).

From *Eryngeon*, a name adopted by Pliny from Dioscorides. Flowers pale blue, nearly globular, Leaves very stiff, broad and sinuate, bordered by coarse prickly teeth. The whole plant is quite glabrous, and glaucous or bluish. (*Umbelliferæ.*)

Prickly Saltwort (*Salsola kali*).

From *salsus*, "salt"; alluding to the saline properties of the genus. The leaves all end in a stout prickle. Flowers sessile in the upper axils. Stamens five. Styles, two or three, often combined at the base. (*Chenopodiaceæ.*)

Grass-wrack (*Zostera marina*).

Zoster, "a girdle." Wrack is seaweed thrown ashore, from a Norse or Frisian word connected with the Danish *vrage*, "reject." Grass-wrack from the long grass-like leaves. A creeping and rooting plant, growing on sandy shallows and sea-banks, and thrown up abundantly after storms.

Flowering sheath near the base of the floral leaves, from one to two inches long. (*Naiadaceæ*).

SEASIDE ARROW-GRASS (*Triglochin maritimum*).

From *treis*, "three," and *glochis*, "a point"; in allusion to the three angles of the capsule. Perianth of six nearly equal segments. Stamens six. Leaves slender, from two to eight inches in length, dilated and sheathing at the base. Flower stems from six to twelve inches high. Flowers small, yellowish-green. (*Naiadaceæ.*)

SEA SPLEENWORT (*Asplenium marinum.*)

From *a*, "privative" and *splenion*, "spleen"; its supposed medicinal qualities which were suggested, on the doctrine of signatures, by the lobular, spleen-like form of the leaf in the species to which the name was first given, the ceterach. Fronds tufted, from six inches to one foot high. Stems black, once pinnate. Segments obliquely lanceolate or nearly ovate. Sori, several on each segment, linear, common on the south and west coasts. (*Filices.*)

PURPLE SEA-ROCKET (*Cakile maritima*).

Generic name for an Arabic term for these plants. Flowers purplish or white, not unlike those of a stock but smaller. Leaves few, thick and fleshy, with a few distant, oblong or linear lobes. (*Cruciferæ.*)

SEA POPPY (*Glaucium flavum*).

From *glaukos*, "greyish-green," referring to the colour of the leaves. *Flavus*, "golden yellow." Also called horned poppy from its long curved seed-pods. Flowers on short peduncles, large and yellow, the petals are very fugacious. Leaves thick, radical ones stalked, rough with short thick hairs. (*Papaveraceæ.*)

GARDEN VEGETABLES FROM THE SEA-COAST.

The ancestral forms of several of our best known and most highly valued garden vegetables—asparagus, beet, sea-kale, carrot and cabbage—may be found on our British sea-coasts.

The wild asparagus (*Asparagus officinalis*) is a rare plant. A Cornish station is mentioned for it in the ninth edition of Babington's "British Botany;" which also records it as occurring on the coast of Anglesea, Glamorgan, Pembroke and Wexford. It was cultivated 200 years before the Christian era in Rome, and perhaps at the same time in this country. The generic name is derived from *sparasso* "to tear," in allusion to the strong prickles arming some species. The flowers are small and greenish-white. Fruit, a small red berry.

The Sea Beet (*Beta maritima*) is common on the sea shore in many places, being especially abundant on the West Coast of Ireland. Bentham holds that white and red beet and the mangel wurzel are cultivated varieties of the sea beet. Other authorities maintain that cultivated beet was introduced into this country in or about 1548. The generic name is from the Celtic bett, red, in allusion to the red colour of the roots. The flowers are green, single or clustered, arranged in long, loose, terminal spikes, often branching into a leafy panicle.

The Sea Kale (*Crambe maritima*) is abundant on sandy sea shores. The coast dwellers of Devon, Dorset and Sussex, have "from time immemorial been in the habit of procuring it for their tables, preferring it to all other greens." It has, however, been generally cultivated only within the past century. In 1750 some roots were sent from Dorchester to Covent Garden Market; the label was lost and the parcel put aside as "some sort of poisonous root or other." Curtis, writing in 1822, remarked upon the many ineffectual attempts to introduce sea kale into the London markets. The generic

name is the Greek for "sea-cabbage, cale, cole or cole-wort." It is a glaucous-green, glabrous plant, with a branched stem about two feet high. The flowers are white, in loose panicles.

The Carrot (*Daucus carota*) was introduced, in the cultivated state, into this country by the Flemings, in the time of Queen Elizabeth. It is common in pastures on calcareous soils, inland as well as near the coast. The concave umbel of white flowers is very distinctive.

The Sea Cabbage (*Brassica oleracea*) may be found on the cliffs of the south and west coasts. It is the stock from which our cultivated cabbages, kale, cauliflower, and other sub-varieties are descended. The red cabbage will revert in a few generations to the primitive form, if neglected in gardens by the sea. The generic name is derived from *bresic*, the Celtic for cabbage. The stock is thick, almost woody. It branches into erect stems one to two feet high. The leaves are large, lobed and glaucous. The pale yellow flowers resemble those of the wild mustard or charlock.

It is of interest to note respecting all these, that although they appear to have been first developed under the influence of the moist and salt-laden atmosphere of the coast, they are by no means dependant upon it. Under cultivation they have been grown with great success in inland positions. It does not follow, however, that they may not still be induced to show some superiority as regards flavour, &c., when produced under their pristine conditions.

List of Mammals which have taken to the Sea.

Cetacea.—Whales, dolphins, porpoises. *Sirenia.*—Dugong, manatee, sea cow. *Carnivora.*—Walrus, seals, sea otter, Arctic bear. Thus we have animals of widely differing relationships which have assumed the same peculiar habits. Only the whales take to the open sea. The others are shore-livers, but neither whales nor sirens ever leave the water.

JOHN AT THE ZOO.

(*Continued from page* 26.)

In the same house (the Civets) the keeper showed us, privately, a new arrival, and one which he said had not been represented in the gardens for a great many years, the "*Aard wolf*." It looks somewhat like a little but very intelligent hyena. I was warned not to confuse the "aard wolf" with the "aard vark," a very different animal. Both are, as the Dutch word aard (earth) suggests, natives of South Africa, and accustomed to burrow. I was told that it differs from all hyenas in having small and very weak teeth.

The English wild cattle at the Zoo have blackish ears and the bull has a dark spot on the lower part of the front legs. The latter is from Chartley. The Chillingham bull presented to the British Museum by the Earl of Tankerville in 1890 has reddish ears. The following label accompanies it: "The white cattle of Chillingham Park, Northumberland, are often recognised as wild animals. This, however, is not the case. They are evidently semi-albinos, descended (as indicated by their red ears) from dark coloured cattle, allied to the Welsh or Pembroke breed, which is probably one of the oldest in Britain and nearly related to the ancient wild ox or aurochs. It will be seen that the horns are similar in shape and colour to those of the Welsh breed. And it is noticeable that when Welsh cattle tend to become white, their ears remain blackish or grey."

Several specimens of the rat-tailed serpent (*Lachesis lanceolatus*) from tropical America have been recently placed in the reptile house. They mimic to a remarkable extent the shingle on the floor of their cage. When in repose the yellowish tip of the tail is frequently vibrated. It then bears

a close resemblance to a centipede or larva. Query.—Is this peculiarity in connection with the simulation by the body colour of its surroundings made use of by the snake as a lure for lizards or frogs?

Notes of a Visit with a Special Object.

To-day let us look at the animals' noses. An animal's nose is continuous with his upper lip. We will begin with the Llamas. Take care that they don't bite you. Give a bit of biscuit and note the movements of the upper lip. It divides into two halves and opens in the middle. It is constructed like a divided skirt. The lower jaw and its teeth project somewhat in front of the upper lip. We will next go to the Giraffe's paddock. These friendly animals will put over their heads and invite us to rub their noses and foreheads, and we can have a good look at them. The upper lip is very different from that of the Llama. It is very large and thick, and hangs over the mouth, everywhere concealing the lip of the lower jaw. There is not a trace of any division. It is quite whole. The nostrils are placed, as slits upon its surface, four or five inches behind its front edge. The animal can move this upper lip freely, and its size and projection are such as to suggest a sort of trunk. There are plenty more of these undivided upper lips to be seen in the gardens. The Zebras, asses, indeed all relatives of the common horse, have them. In the horse the upper lip is so large as to suggest some use of it in gathering its food. It is obvious that the Llama would be much hampered in using its cleft lip for seizing things or for drawing grass, &c., into its mouth, a horse, on the other hand, can do so easily.

You will find many animals, the large deer for example, in which it is difficult to say whether the upper lip is cleft or not. It is partly cleft, and where the gap ends there begins a black line which looks as if the two sides had been clumsily joined together by a dark scar. It is not always easy to be

sure of these details unless you get a patient, hopeful animal which will keep its nose quite quiet in expectancy of biscuit.

If by any chance you could persuade a hare or a rabbit, or a rat, to let you look at its lips, you would find yet another modification. In them the slip is not single and straight, but in the form of the letter Y. In the fork of the Y is included a bit of hair-growing skin which is joined above to the middle of the nose, and forms part of what is technically called "the columna."

We forgot when looking at the zebra's lips to examine those curious animals in a cage not far distant, the Tapirs. In the tapir, as in all the pig family, not only is there no trace of a slit, but the whole upper lip is prolonged into a snout. This snout or modified nose and upper lip is movable and may be curved downwards and backwards into the mouth. If you watch a tapir you will see it pick things from the floor by means of its nose and throw them into its mouth.

Having seen what the tapir can do with its nose, it is not a very long step to realise that the long trunk of the elephant is, after all, only its prolonged upper lip and nose.

It is of much interest to trace these various gradations of modification in different animals, and to note the mutual relationships which they imply. We may even remember profitably that some human infants are born with what are called "hare lips." In some of these instances the clefts are similar to those observed as natural in certain animals. They are examples of certain arrest in development and are evidences of what is known as "recapitulation."

BOOKS FOR THE SEASIDE.

With prices from recent second-hand catalogues.

The following list may assist some of our readers who are desirous to take with them to the seaside trustworthy books on its natural history; many or most of them are out of print, but may easily be obtained second-hand.

"Marine Zoology of the British Isles," by P. H. Gosse. Numerous engravings, 2 vols, 12mo, cloth, 1855-56 (pub. 15s), 7s. 6d.

"A Year at the Shore," by P. H. Gosse, 36 coloured plates, 1865, 6s. to 10s. 6d.

"Sea-side Studies at Ilfracombe, Tenby, the Scilly Isles and Jersey," by George Henry Lewes, Second Edition, 1859, 4s. 6d.

"Tenby, a Sea-side Holiday," by P. H. Gosse, 24 coloured plates, 12mo, cloth, 1856, 10s. A narrative of six weeks' work exploring tide pools, searching caverns, &c.

"A Naturalist's Rambles on the Devonshire Coast," by P. H. Gosse, illustrated with 28 plates. It was published at £1 1s., and is now somewhat scarce, but second-hand copies are occasionally offered at half price.

"Beach Rambles in Search of Sea-side Pebbles and Crystals," by J. G. Francis, London, 1861, 8 coloured plates, 4s. 6d.

"The Sea and its Living Wonders," by G. Hartwig, 12 chromo plates and numerous woodcuts, 1861, 8s. 6d. The Fourth Edition (1873) with 8 plates, may be obtained for 5s.

"History of British Sessile Eyed Crustacea," by Messrs. T. Bell and J. O. Westwood, 2 vols with numerous engravings, published at £3 in 1863, 18s. 6d.

"History of British Stalk Eyed Crustacea," by T. Bell, 1853, 174 engravings, 15s.

"History of British Starfishes and other Animals of the

class Echinodermata," by Edward Forbes, 1841, numerous woodcuts, 10s. 6d.

"History of the British Hydroid Zoophytes," by Rev. Thomas Hincks, 68 plates and numerous woodcuts, 2 vols, 8vo, cloth. Published at £2 2s. in 1868, may now be obtained for 15s.

"History of British Sea Anemones and Corals," by P. H. Gosse, with 12 coloured plates, published at £1 1s. in 1860, may be obtained at 7s. 6d. to 12s. 6d. according to condition.

"British Conchology, or an Account of the Mollusca which now inhabit the British Isles and the surrounding Seas," by J. Gwyn Jeffreys, 5 vols, coloured and plain plates, 1862-69, £4 to £5. Though nearly forty years old this work is still the standard one on the British Marine Mollusca.

"Principles and Management of the Marine Aquariums," by W. R. Hughes, 3 plates, cr. 8vo, cloth, 1875, 2s. 6d.

"The Aquarian Naturalist," a Manual for the sea-side, by T. Rymer Jones, 8 coloured plates, post 8vo, cloth, 1858, 10s.

"History of British Zoophytes," by G. Johnston. Second Edition with 74 plates, 2 vols, 1847, 15s.

"British Zoophytes and Corallines," by Rev. D. Landsborough, 20 coloured plates, 1852, scarce, 7s.

"British Zoophytes," by Arthur S. Pennington. An introduction to the Hydroida, Actinozoa and Polyzoa, 24 plain plates. A very useful and concise guide to all known British species, published at 10s. 6d. in 1885, occasionally offered at 5s.

"Evenings at the Microscope, or Researches among the minuter Organs and forms of Animal Life," by Philip Henry Gosse, F.R.S., New Edition, revised and annotated, S.P.C.K. 1884, 2s. 6d.

"Dawson Turner's Fuci (Seaweeds)," 4 vols. with 258 coloured plates, £5 to £8. An old work, date 1808. The plates have not been equalled in any modern treatise.

Harvey's "Phycologia Britannica," 4 vols, 1846-1851, about £6 6s.

Harvey's "British Marine Algæ," 1849, out of print, 21s.

"British Seaweeds," by Samuel Gray, 1867, 16 coloured plates, 5s. to 7s. 6d. An attempt to combine the popular and scientific.

Landsborough's "Popular History of British Seaweeds," Second Edition, 1851, 20 coloured plates, 5s. 6d.

"Revised List of British Marine Algæ," by E. M. Holmes and E. A. L. Batters, Henry Frowde, 1892, 2s. 6d. A hand list only, but indispensable to the serious student.

"An Introduction to the Study of Seaweeds," by George Murray. Macmillan Co., 1895, 7s. 6d. The best general account of the group.

OUR GILBERT WHITE PAGE.

Prehistoric Haslemere.

On the evening of Thursday, June 21, a paper — the joint production of the Editors of the present Journal—was read before the Royal Society of Antiquaries on the discoveries which have been recently made concerning the pre-Roman inhabitants of this part of England.

It was divided into two parts, one dealt with the flint implements and weapons of neolithic times ; the other detailed the discovery of an urn field or cemetery of the late Keltic period. Many examples of barbed arrow-heads of flint, and Keltic pottery were exhibited.

Reference was made to the Blackdown flint factory, and the large series of flint and other stone weapons[1] which had been found there by Mr. Allen Chandler, J.P.

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[1] Some curious perforated circular hammer stones, and rubbing stones from this spot, also a remarkable ironstone implement from the railway cutting, have been figured and described in the *Trans. S. E. Union Scientific Socs.*, 1904-5.

This factory was on the margin of a small pool. The raw material must have been brought from the chalk hills nearly ten miles distant.

Concerning the Keltic pottery it was stated that the urn-field was near Haslemere Town on the watershed at the top of the railway cutting. The Kelts practised cremation and deposited the bones and ashes in urns arranged in "family circles." There was no mound to mark the position of the circle of interments, the circles themselves were sometimes many hundred yards apart. The first discovery of pottery of this date at Haslemere was in November, 1903, when several broken urns and a few accessory vessels were brought to light. Two years later another "circle" of graves was accidentally found. It contained three almost perfect cineraries and many broken ones, also a large number of bowls, pateræ, and other accessory vessels which had been placed around the urns. Some of the urns contained flint chips, and one of them yielded the only piece of bronze found, a fragment of a fibula. The find included two pieces of imported Samian ware; one, a patera, was used as a cover for one of the urns. A large patera of the ordinary dark brown Keltic ware served as a lid for another cinerary. There was no trace of iron. A hole in the bottom of one of the urns had been repaired by inserting a lead plug; this was a very unusual discovery. The latter half of the first B.C. century was mentioned as the probable date of the cemetery. The authors, in conclusion, expressed their indebtedness to the owners of property who had allowed them to dig, and who generously presented the "finds" to the Museum.

Mortality amongst Shrews.

We read in Bell's "British Quadrupeds" that "the female shrew brings forth in the spring from five to seven young ones. The nest, which consists of soft herbage, is made in

any hole or depression on the ground, or in a bank; it is covered over at the top, and is entered at the side. The increase of the species which such a numerous progeny would be calculated to produce is counterbalanced not only by the destruction which takes place amongst them through the agency of other animals, as Moles, Weasles, and Owls, but by a very general mortality which prevails early in autumn, the cause of which does not appear to be understood. It is common at that season to find numbers of them lying dead in the fields and hedgerows, without any apparent external injury."

Later writers have remarked that this singular mortality remains without satisfactory explanation. Can our readers assist in solving the mystery? Dead shrews were observed by the roadsides around Haslemere yesterday (June 23). They bore not the slightest trace of external injury, and were well nourished.

The Eschscholtzia and its Hood.

Everyone is familiar with the hood which the Eschscholtzia flower carries on the top of its growing petals. Children call it a nightcap, Professor Lindley, a hutkin. It serves to protect them from heat, wind and wet, until they are well grown. When strong enough they lift it off. It consists of the calyx of the flower, of which the sepals have cohered at their sides and afterwards suffered detachment at their bases. Once detached it is no longer capable of growth, and as the petals within continue to grow they lift it higher and higher, whilst it still retains sufficient power to keep their delicate tips folded up, and completely covered. Various other plants enjoy somewhat similar arrangements for the protection of their buds or growing points. In most of the cone-bearing or fir tribe, the points of the spring shoots carry a bee-hive like cap of brown bracts which protects their youngest and most delicate needles. The lower leaves are

liberated from it one by one as the shoot grows upwards, carrying with it its perfectly detached cap. The spring shoot of a Nordmann pine may attain a height of six inches before it loses its cap.

Pollinia which Travel.

The pollinia of the Bee orchis are most interesting structures. An oval mass of gold is mounted upon a long slender thread, like anther and filament. The filament is often very long, so long as to allow of the two, having approached, twining round each other. Many parts in an orchis show a tendency to twist, and now and then these filaments even accomplish two turns. The whole pollinium is very loosely attached, and when ripe is very prone to be broken off. When so broken its end is very sticky and will glue itself upon anything which it touches. Thus the bee or moth thrusting its head into the flower often carries away the pollinia like horns fixed to its head. If fully blown flowers are put into the vasculum with others, the pollinia of the Bee may be found sticking to the petals or leaves of others. They usually travel in pairs, and they adhere with great firmness. The pollinia of others of the orchis tribe are also prone to detach themselves and travel.

It is perhaps desirable to explain that a pollinium is not exactly a stamen, although it looks much like one. It is part of a divided anther, the filament of which has undergone modification and become united to the style and thus lost.

SEASONAL NOTES. JULY.

The aphis of the pineapple cones on the spruce-fir will now be ready to escape, and should be looked for. The perfected insects will creep out from the opened valves, which they entered as larvæ six weeks ago. In the meantime their presence has stimulated the growth of these beautiful false cones. On escaping the insects will glue their feet firmly to the adjacent needles, and will then split open their skins on the upper or back surface, and emerge with wings and fly away. Their skins will be left like so many pale ghosts attached to the leaves.

July is a good month in which to watch, in many plants, the formation of seed vessels and seeds, and to note the rapidity with which the process proceeds. All housekeepers are familiar with this uncompromising rapidity in the case of the pea, and know how almost impossible it is to induce the gardener to keep pace with nature and gather his successive crops early enough. A few days makes all the difference between marrowfats which are delicious and those not worth eating.

The dropping of flowers before the seeds have set is an occurrence well worthy of attention. It occurs under various influences in a variety of plants. In the potato—on which it may now be most advantageously observed—it is caused by the competition of the underground tubers. In the lupin and foxglove it is often brought about by poverty of soil, want of rain, and by a tendency to produce flowers too abundantly.

Galls of all kinds should now be watched in their processes of growth. Those on ground ivy, enormous in proportion to the size of the plant and now looking like green marbles, will soon take on beautiful tints of colour. It is indeed a remarkable feature in many gall-formations that they originate a tendency to coloration which is not displayed by any other

part of the plant. The oak-apple gall is often very delicately streaked with tints which might be admired on the fruit itself. The galls of the poppy are worth notice. If the seed vessel appears unusually large, and is so heavy as to hang down instead of standing erect, it is almost certainly the home of gall insects. It may be of interest to note that whilst our field poppies are often attacked, those grown in our gardens or of foreign species usually escape. The Eschscholtzia in England has no gall. This is probably to be explained by supposing that the proper gall-insect for that plant has not yet been imported. The gall-flies are very discriminative as to the subjects of their attacks, and our indigenous flies do not appear to welcome strange hosts. But few of our numerous imported conifers appear as yet to be liable to attack by insects, although several suffer from fungi. The influences of the thistle-rust on the plants which it infects should now be watched. It will cause its hosts, many of which have appeared up to this date to flourish remarkably under its companionship, to wither as if burned. Look for the fungus on the under side of the leaves of any thistles which have turned yellow.

The development of "smuts" in corn crops is a matter for August rather than July, but in forward districts may be seen this month. We shall have a note as to mode of infection in our next number.

The Sundews (*Drosera*) flower this month. All are insectivorous or carnivorous, deriving their nourishment from captured insects. There are three British species.

D. rotundifolia is the commonest. It has rounded (orbicular) leaves. *D. intermedia* has oblong (spatulate) leaves; it is widely distributed, but is much less common than the round-leaved one. The remaining species, *D. anglica*, has obovate-lanceolate leaves. It is rather rare in the bogs of Great Britain, but is common in Ireland.

In all sundews the surface of the leaves is covered with reddish-purple "hairs" or tentacles, bearing a sticky secre-

tion on glands at their tips which attracts insects. An insect alighting upon a leaf is detained by the sticky fluid, the tentacles in the meantime bend over and envelop the victim. The fluid dissolves and digests the nutrient parts of the insect. The glands afterwards dry, the tentacles unclasp, and the indigestible parts of the insect are blown away by the wind. Secretion then recommences, and the plant is ready for another meal. The usual cause of death of these plants, when kept in vivaria, is overfeeding.

Several of our readers have sent us for identification specimens of the "*peach-leaf curl.*" It is, as we noted last month, caused by a fungus known as *Exoascus deformans*. The leaves become much thickened and distorted, and reddish in colour. This disease, which has been known in Great Britain for a great many years (it was accurately described under the term "blight" by a gardener in 1821), is steadily gaining ground, and is very abundant in the South of England this year. Spraying does not always get rid of it, as the mycelium may enter the branch, in which it spends the winter. It never grows backwards, but always extends forward in the direction of growth; hence, if all branches bearing diseased leaves are cut off at about two inches behind the lowest infected leaf, the fungus will be got rid of. All infected parts should be burned.

Many rust fungi (*Uredines*) may now be observed on the leaves and stems of plants. Very common species are—

(1) *Phragmidium subcorticatum* on leaves of the Dog Rose (*Rosa canina*), forming bright orange spots on the upper surface of the leaves, the corresponding spot on the lower surface being light brown with darker masses of the teleuto spores.

(2) *Phragmidium bulbosum*, causing red spots on the upper surface of bramble leaves, the clusters of dark spores may be seen on the lower surface of the leaves.

The circular purplish spots on the leaves of the Dogwood (*Cornus sanguinea*) are induced by the fungus *Phyllosticta cornicola*.

The fungus often responsible for the very unpleasant odour in woods, especially those of fir, in July and August, belongs to a very remarkable group, the *Phalloideæ* or stinkhorn fungi. It is scientifically known as the *Phallus impudicus.* In the young state the whole plant is enveloped in an egg-shaped volva, consisting of three layers, and is then without smell. Upon bursting the volva it attains full size with great rapidity. The white honeycombed stem is surmounted by a cap with polygonal cells upon it. These cells contain an extremely fœtid green slimy substance, in which are immersed the spores or seeds. Flies and other insects are attracted by the smell, which resembles carrion, and, feeding upon the slime, carry away the spores, which are thus dispersed over large areas.

The larvæ of the onion fly (*Anthomyia ceparum*) now attack onions. There is no mistaking the symptoms, the leaves fade and turn yellow; all plants with yellow leaves invariably contain two or three larvæ. The larvæ feed for a fortnight, then leave the bulb and pupate in the earth. In Miss Ormerod's "Manual of Injurious Insects," prevention and remedies are discussed at some length. The attacked onions should be carefully extracted at once, by means of a spud or an old knife, but never pulled up. If this is done thoroughly, the next brood of flies will be much diminished.

SELECTED EXTRACTS.

VARIATION IN THE WALL LIZARD.—Mr. G. H. Boulenger, F.R.S., in a paper recently published in the *Transactions of the Zoological Society*, has struck a blow at the present-day splitting of species and races. He writes: "Of late a tendency has sprung up to multiply greatly the species, and thus destroy the old conception of *Lacerta muralis*." . . . "Characters of form and coloration are given as distinctive, which on examination of even moderately large series of specimens prove to be worthless, while others of greater importance have been overlooked or neglected."

WIRELESS TELEGRAPHY.—According to J. S. Sachs (in the *Annalen der Physik*), the higher one is above the earth, the better the transmission; apparently the earth is detrimental to the dissemination of electric waves.

TUBE ARRANGEMENTS IN WOOD.—Mr. Herbert Stone, F.L.S., has been carrying out experiments to ascertain if the mature vessels of dicotyledonous wood are very limited in length, as is, he thinks, usually supposed to be the case.[1] He writes: "The largest tree that I have so far been able to obtain is an ash sapling, 14 feet 2 inches long. By means of a rubber tube, attached to the upper end of the pole by a brass cap screwed on to the wood, I am able to cause a current of air to pass through the whole length of the pole with no more pressure than I can exert with my lungs. The experiment succeeded equally well when the tree was freshly felled, or when quite dry."—(*Proc. Assoc. Economic Biologists*, July, 1905.)

THE SUN'S CORONA.—It is invisible except at an eclipse (the earth's atmosphere prevents us from seeing it), and then only during the brief moments of totality. Photographs of the

corona show that it varies from eclipse to eclipse. At *maximum* sun spot periods the corona spreads indifferently all round the sun, but when these periods are at minimum it spreads rather in the direction of the sun's equator. —(Professor H. H. Turner).

THE INTERIOR OF THE EARTH.—"There does exist absolute proof that the earth is a cooling body. The high temperature that has been registered at the bottom of mines and deep springs proves the point beyond all doubt that, as the centre of the earth is approached, the temperature becomes higher. . . . Taking the average of all the observations, it would appear that the temperature rises 1° F. for every 51 feet of the earth's crust penetrated."—(Bereford Ingram in *Knowledge*, January, 1906.)

TSETSE-FLY AND SLEEPING SICKNESS.—Mr. A. E. Shipley, F.R.S., in his address on "Insects as Carriers of Disease," delivered before the British Association at Pretoria, remarked that Colonel Bruce has shown that the sleeping sickness of Central Africa is conveyed by a species of tsetse-fly (*Trypanosoma*). In three years in Uganda 100,000 people had been killed by it. The trypanosoma lives in the blood without doing much harm, it sets up the sleeping sickness only when it reaches the cerebro-spinal canal.

MIGRATION OF FISH.—The general facts brought out by Mr. Garstang's experiments are these: "The smaller fishes do not appear to migrate to any considerable extent, and the larger is the fish the more extensive are its migrations. In some cases the distance travelled has been very considerable; thus one plaice is shown to have travelled a distance of 175 miles in about six weeks, and another travelled a distance of 210 sea miles in eight months. The general trend of the migrations has been in a southerly direction during the winter, and in a northerly one during the summer. As a

rule, the smaller fishes travel from the shallow water 'nurseries' to the deeper waters during the earlier period of their life."—(Mr. J. Johnstone in *Nature*, January 11, 1906.)

Two Insect Pests of the Cotton Plant have been fully described in two reports recently issued by the United States Department of Agriculture, Bureau of Entomology. They are the "Cotton Boll-worm" and the Mexican Cotton Boll Weevil. Twenty years ago the latter was a little known species, to-day it is a terrible pest in the United States, Mexico, Cuba, and Guatemala. It is said that the annual progeny of a pair of these weevils amounts to 12,755,100.

Giant Elephants.—According to evidence adduced by Mr. G. E. Pilgrim in a recent issue of the Geological Survey of India, the great fossil elephant (*Elephas namadicus*) from the Pleistocene of the Narbada Valley, India, is identical with the straight-tusked elephant (*Elephas antiquus*) from the Pleistocene deposits of Europe. From measurements of a very large femur or thigh-bone, Mr. Pilgrim concludes that *Elephas namadicus* must have occasionally reached as much as 16 feet in height at the shoulder. Commenting upon this in the *Field*, "R. L." remarks: "Eleven feet is apparently the maximum reported height of the Indian elephant as recorded from specimens in the flesh."

It may interest our readers to know that the skull of one of the largest Indian elephants on record may be seen in our Haslemere Museum. This animal was killed and measured by the late Mr. Varian in Ceylon in 1882. Its height at the arch of the back was 11 feet 9 inches; it was 8 inches less at the withers.

The Secretary for Agriculture in the United States of America, in his Report for 1905, states that very important results have been gained by the introduction of beneficial insects which are known to prey upon injurious insects.

Mr. R. Stewart MacDougall describes in the January issue of the *Journal of the Board of Agriculture* a new enemy of the Douglas Fir, an insect hitherto not recorded in this country. It is known as *Megastigmus spermotrophus*, and "belongs to a family of hymenopterous insects, the *Chalcididæ*, the larvæ of which in the great majority of cases are not feeders on plants, but are parasitic on other insects."

The larva lives in the seed, where it also pupates; externally there is no indication of its presence.

QUESTIONS FOR ANSWERS.

(1) To which century, and to what author, would you assign the following lines? A special prize will be given for the best rhymed translation of them.

> Vous fiers Anglois, et barbares que vous êtes,
> Compez la tête à vos rois et la queue à vos bêtes;
> Mais nous François, plus polis, et aimant les loix,
> Laissons la queue à nos bêtes, et la tête à nos rois.

(2) What does the epithet *calamita* mean when applied to the natterjack toad (*Bufo calamita*)?

(3) Is the toad in the language of the naturalist a "reptile," and if not, why not?

(4) The smooth snake (*Coronella austriaca*) approaches more closely to the viper than to the common snake in general appearance, but is always smaller, and a double row of spots down the back takes the place of the familiar zigzag line running down the back of the viper. What are its real relationships?

(5) It is on record that a Scotch seedsman, having opened a new shop in Dublin, advertised in his catalogue that he had mole-traps for sale! Where lies the joke?

(6) Could an elephant take a bite out of an apple if the apple were big enough? No; for he has no biting teeth.

He has only molars or chewing teeth, and everything that is brought to them must be conveyed by his trunk. Explain what is meant by "biting teeth" and give their proper designation.

(7) Of what animal is it true that if his nose were cut off he would starve, and probably die? If the elephant lost its nose, that is, its trunk, it could not feed, since it has no biting teeth, and its tusks would prevent its seizing objects with widely open mouth. What expedients might an elephant which had lost its trunk adopt?

(8) Does the elephant carry its tusks in its upper or lower jaw, and what teeth do the tusks represent?

(9) If you had to prescribe for a sick crocodile, would you ask him to put out his tongue? No; for he could not do it. Why not? His tongue is flattened and fixed in the floor of his mouth. This explains, then, the tradition that crocodiles have no tongue? Yes; and it may be observed that crocodiles have no salivary glands, their mouths being dry when out of water. Name other animals in which the tongue is fixed, and others in which the tongue is dry.

(10) In bats the skin is very loosely attached and some of them (the genus *Nycteris*) possess the power of inflating themselves with air. There is an opening in the cheek pouch which permits the animal to blow air under its skin and to force it to pass over almost the whole body, the skin being fixed only at certain points. Under what law in physics does the bat which thus makes itself a balloon gain an advantage? (See Todd's "Cyclo." I., 599).

9

CORRESPONDENCE.

TO THE EDITOR OF THE MUSEUM GAZETTE.

Vol. I., part 1, page 14.—Would it not be more correct to say here, Head of "Roe-deer," or "Roe-buck"?

Do., page 18.—"*On crows.*" Surely crows *are* migrants. *Rooks* migrate—hooded crows cross the North Sea. Even jackdaws and choughs have been known to accompany great flights of rooks at times. Undoubtedly ravens collect together, and roost in numbers together at favourite winter resorts, and often in far larger numbers than the whole district could yield.

Do., p. 24.—*Lightning and beech trees.* It is said beech trees are "more shattered," &c. But the point is, how often *are* beech trees struck by lightning? I cannot recall *one.*

J. A. HARVIE BROWN.

We will answer our esteemed correspondent seriatim, and we sincerely hope that he will continue to favour us with his criticisms, for they are suggestive and valuable.

As regards the Roe-buck's head, the suggested alteration would be more detailed, but not a whit "*more correct.*" It was especially desirable to avoid distracting the reader's attention by needless detail, and to allow it to concentrate on a condition common to the deer tribe. Our object was to illustrate fur on the antlers, not the physiognomy of any particular deer.

As to the migratory habits of Crows, our correspondent refers to interesting and well-known facts. Do they, however, justify the application of the term of "migrant"? If they do almost the whole of English bird life would come into that category. We might perhaps conveniently speak of local migrants and distant migrants, meaning by the latter those which periodically and as a whole race leave our shores. Under this latter head none of the British Corvidæ come. Nor do they, so far as we are aware, ever entirely desert a locality, even for a short time. They are migratory in no stronger sense than the whole English population may be so described because certain portions of it every summer habitually go to the seaside. There is, however, no reason to concern our readers, on the present occasion, with the definition of the word "migrant," for the simple reason that we did not use it. If Mr. Brown will again read the article upon which he comments, he will see that what we wrote was, "None of them are *birds of passage*," and about this it may be presumed there can be no dispute.

As regards the *immunity of the beech from lightning*, our cor-

respondent relies too much on personal experience. The statistics collected by M. Flammarion showed that the beech was as much liable as the ash. His numbers were:—54 oaks, 24 poplars, 14 elms, 11 walnuts, 10 firs, 7 willows, 6 pines, 6 ashes, 6 beeches, and a few of a great variety of others. These statements applied to France, and very much depends upon the relative abundance of any given tree in the locality. Not improbably, Mr. Harvie Brown has never known a walnut struck, for walnuts are far less common in England than in France. At Haslemere we have but few records of beeches being struck, but then large beeches are not common, and are very usually protected by other adjacent trees which, towering much higher, serve as lightning conductors. The birch is not mentioned once in M. Flammarion's list, but very possibly there were few or none of large size in the districts concerned. We know of no proved instance of a birch being struck at Haslemere.

It is only fair to Mr. Harvie Brown to add that we do not wholly trust the statistics we have quoted in his confutation. We believe that in English experience the beech tree is not struck nearly so frequently as the ash, and in due course we shall have something to say in explanation of the fact. At the same time it is certain that they are not immune, and we believe that, when struck, they are usually splintered, which is all that we suggested in the passage criticised.

OOPHAGIST.—The precept is probably the following: "*Si sumas ovum, molle sit, atque novum.*"

IT is generally believed that if an egg be pricked at its rounded end, even with the smallest needle, it will be killed. It is at this end that there is a collection of air, *Folliculus aeris.* The quantity of air accumulated here is said to be greater in those birds which are well advanced in development than in those born forlorn and helpless. Thus the eggs of all birds which nest on the ground have a large air vesicle.

XYZ.—The following quotation from Professor Ray Lankester's recently published Lectures may answer your question:—

"An important general fact, which I cannot dwell on further, is that whilst it is true that the great animals occur in the later stage of the world's history, there is a gradual succession from simpler to more complex forms of life. We get fishes at the top of the Silurian, and the silver-scaled fish which are so abundant at the present day, with their symmetrical tails, such as herring, salmon, carp, roach, perch and other modern fishes more curious in form, such as eels, flat fishes, sticklebacks, pipe fishes and parrot fish, are all of comparatively recent origin. They are not found in the rocks older than the cretaceous system. On the other hand, the sharks and dog fish of to-day are

the most ancient kind of fish known to us, remains of shark-like fishes occurring in Silurian strata. But the sharks have soft cartilaginous skeletons, and have only as a rule left teeth and spines and the denticles of the skin (shagreen) in the rocks."

DRAWBACKS TO FUNGUS EATING. "Berkeley" writes: "The common fairy ring champignon is the very best of all our fungi, yet there is scarcely one person in a thousand who dare venture to use it. With common observation no mistake need be made, *though another species possessing high acrid qualities sometimes accompanies it, and might pass muster if attention be not paid to the narrower gills and their darker colour.*"

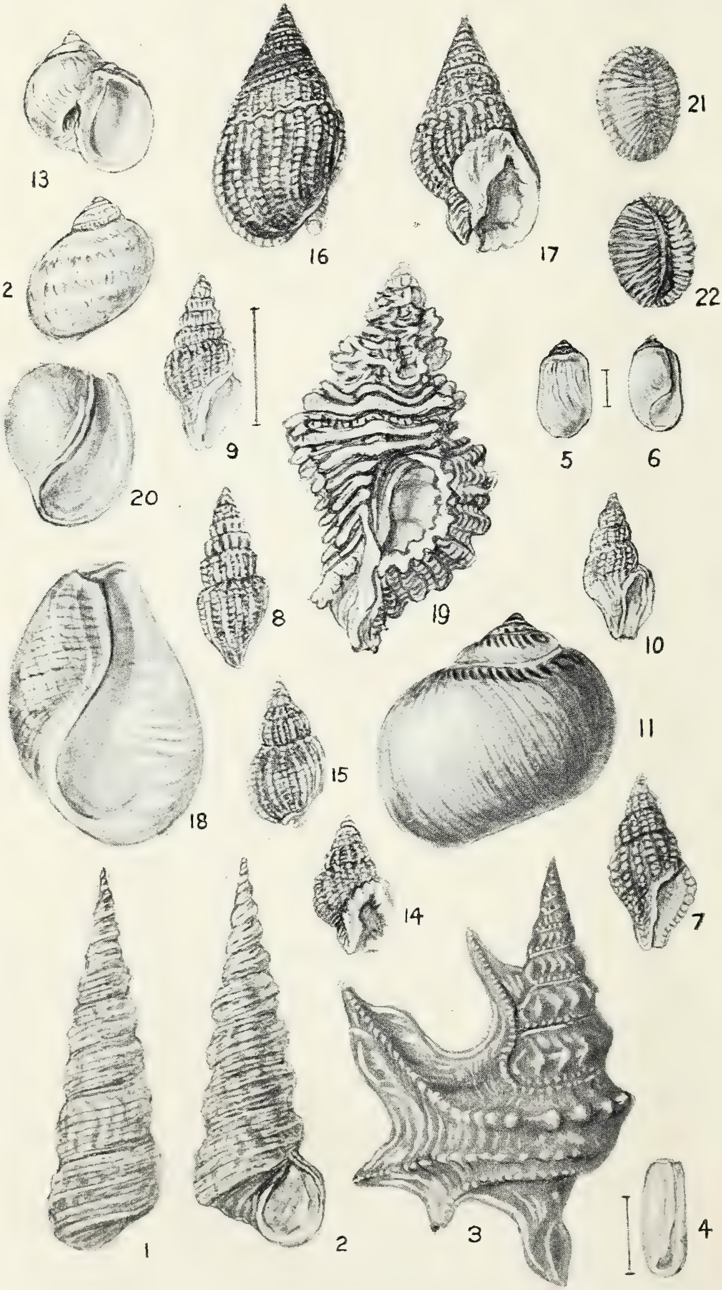
It is clear from this that the mycophagist who desires to enjoy his fairy ring champignons in safety should gather them himself and look carefully at the width and colour of their gills. After all width and colour are matters of degree and not always easy of estimation. The injurious species is the Marascius urens.

INLAND INFLUENCE OF THE SEA.—An account of the influence of a "salt storm" from the sea upon vegetation fifty to seventy miles inland will be found in the seventh volume of the *Linnæan Society's Transactions.*

REGENERATION OF PARTS IN MAMMALS.—At the December meeting of the Zoological Society was exhibited the skeleton of the tail of a dormouse, showing distinct evidence of reparation after an accident; this being apparently the first recorded instance of the regeneration of bony structure in mammals. The re-formed vertebræ, which had assumed the form of a slender rod, was composed externally of true bone, whereas in the regenerated tails of lizards the new structure consists of calcified fibro-cartilage (*Knowledge*, February, 1906).

JUVENIS.—What you have observed is of common occurrence. It is, in fact, an illustration of a general law that is sometimes spoken of as "recapitulation."

Amongst the many instances in which young animals show conditions which belonged to their far distant predecessors but are no longer seen in grown-up individuals, we have the hairiness of young elephants. They are born covered with soft hair, which falls off during the early months and leaves the hide bare. The same is the case with the human infant, which is always down-covered at birth. The term *lanugo* is applied to this congenital, but only transitory, coat.



British Sea Shells.

THE

MUSEUM GAZETTE.

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EDITORIAL NOTES.

The present is our second Gazette devoted chiefly to Seaside Topics. In our July number we dealt with the phenomena of the Tides and endeavoured to explain that they are not on the English seas due so much to any local attraction of the sun and moon as to the propulsive force of great ocean masses of water set in movement in the southern hemisphere. Explanation was also offered of the puzzling fact that whilst the influence of the moon is brought to bear on any given part of the earth only once in a day, there are yet two tides.

Proceeding next to illustrations of Seaside Natural history, we offered our readers seven beautiful plates taken from Professor Johnston's Work and exhibiting different forms of zoophyte life. In the descriptions appended to these plates some of the most marvellous facts in the whole range of natural history were referred to. After a brief note as to Seaside Collecting we passed to comparatively simple matters and gave descriptive lists of seaside plants, &c.

In this month's issue we continue the same class of subjects. We offer a few words of advice as to bathing and describe the best method of reviving those apparently drowned. Our chief topic is, however, a description of British

sea-shells; designed to enable those who collect them to assign their names and classify them. A chapter on sea-fish from the pen of Mr. Pycraft, one on sea-birds from that of Mr. Dixon, and another on Marine Aquaria by Mr. Sibert Saunders, a gentleman of great practical experience, are also given. Respecting the last named, we may remark that although professedly written for use after returning home, it is equally suited to afford guidance to the yet more numerous class who may incline to add to the interest of their sojourn by fitting up temporary collections whilst staying at the seaside.

Other papers in our present pages offer some memoranda as to the Moon; notes as to the Natural history of various Seaside Resorts, and that we may not be too merely tantalising to those who have not had the good fortune to get to the seaside, we offer at unusual length our SEASONAL NOTES.

So large an amount of seaside material has accumulated on our hands, that we propose to continue this somewhat special character of the Gazette in our September number, and may take this opportunity to remark that September is for the naturalist a much better month for the seaside than either of its predecessors. Many more objects are likely to come ashore with the better tides and somewhat rougher weather, and the sea-birds—waders especially—have returned in their numbers. The cooler weather also favours industry.

Not only to the naturalist, but also to the health-seeker, September and even October, are better months for the sea than July and August. It is a great pity that the fashionable seaside season cannot be prolonged. The exigencies of the school terms make, we are aware, this for many an impossibility, but those who are not under compulsion in this direction cannot be too strongly advised to take their seaside holiday late in the year. The air is far more invigorating and favourable to exercise. The crowd is less and the

possibility of quiet is much increased. If a taste for study and natural observation have been duly cultivated there need be no dulness in the longer evenings, nor in the possible occurrence of a rainy day. For the same cost rooms affording double the comfort of those obtainable in August may often be had. For young and delicate children autumn at the sea is especially to be recommended. As a rule, no one catches cold at the seaside, and a condition of hardihood may be gained by exposure to October breezes which the sultry days of August are powerless to confer. Nor is it to be forgotten that October comes nearer to November and December, with their cold and damp, and that there is less risk that what has been gained in the holiday may be, to a large extent, lost before the time of trial comes.

We need perhaps say nothing as to advantages of early rising at the seaside. Great as these are everywhere, they are multiplied at the sea, especially during the hot and fashionable months. Those who go in October may indulge an hour longer, if so inclined, but those who are there in August should rise with the sun. The sands are then untrodden, the breezes are refreshing, and all Nature is delightful. To the shell-collector it is essential to be first on the shore, and very often the very early morning is by far the best time to meet the fishermen returning in their boats and thus secure some of their treasures. It is also the best time for getting an appetite for breakfast.

Our notes of various seaside resorts will have come, we fear, rather too late for the guidance of a large majority this season. They may, however, be found interesting to those who are already located at one or other of the places alluded to. They may also serve useful purposes for next year, and one of the least alloyed pleasures of the last week of a holiday is the discussion of the place where the next shall be spent. We hope, if permitted, greatly to extend our list of places

next summer, and to add much in detail as to some already mentioned. We venture to ask the assistance of our readers in this matter. If those who have this summer acquired special experience as to the places they have visited which they think may be valuable to others, will kindly supply it to us, we will endeavour to utilise it. It is not wished to be informed as to the exact localities of rare plants, but there may be no harm in specifying the position of the quarry or the cliff which has been found productive, or the best fields for the collection of shells or zoophytes.

It has been to us a subject of ever-recurring regret that we have not been able to mention more frequently the existence of a SEASIDE MUSEUM at the place recommended. Indeed, we hardly know of a single town in which anything deserving, in a special sense, such a designation is to be found. May we hope for better things next year? Such Museums would surely add much to the attractions of the places which may possess them. They should be large, so as to constitute a pleasant lounge on a rainy day. They should have their Aquaria and their botanical Vivaria. Whilst aiming mainly to illustrate seaside objects, they should exclude nothing possessing scientific or intellectual interest likely to prove attractive. Should any seaside resorts proceed to provide such museums they shall have our best assistance in making them known. Meanwhile any advice or help that we can afford will be gladly accorded.

SEASIDE RESORTS AND THEIR NATURAL HISTORY.

CLEETHORPES.

THIS little town—formerly two little villages—is on the south side of the estuary of the Humber, just opposite Spurn Point. It offers but little attraction to the geologist. It is on glacial clay, but the only "cliff"—in which in former days a section was exposed—is now entirely occupied by an ornamental garden. Passing towards Humberston a low piece of clay-cliff may still be seen, and by visiting a brickyard on the other side of the town towards Grimsby, recent cuttings in it may at any time be examined. On the shore, just below the gardens, and towards Humberston, good specimens of "scratched stones" may be picked up. A wide extent of sand is laid bare at low tide, but it thinly covers the clay, and in many parts is muddy. Where the clay is exposed, out to sea, it may be found bored by immense numbers of razor-shells and paper-shells (Solen and Pholas). The chief attraction for the naturalist at Cleethorpes is its abundance and variety of shells. Every tide brings up a fresh supply, especially if the weather be rough. The best place for finding them is between Cleethorpes and Grimsby. On rare occasions good-sized masses of the best amber may be picked up.

The botany of the district is of interest not only for seaside plants but for those of the inland ditches. The flowering rush and the *noli-me-tangere* balsam are abundant.

COAST OF ISLE OF MAN.

(*From a Correspondent.*)

Geology.—Raised beach in the north. Glacial-drift cliffs extending from Ramsey round to Kirk Michael, in which fossils are to be found. Clay-slate cliffs for the most part.

Between Castletown and Port St. Mary, Carboniferous Limestone. At Scarlet the best example of a volcano in the British Isles. Poolraish limestone noted for its fossils. Posidonia limestone deposit at Poolraish also. At Port St. Mary, glacial striæ on the limestone are well exhibited. Carboniferous basement exposed at Langness. Red sandstone of disputed period at Peel.

Zoology.—Aquarium and Biological Laboratory at Port Erin, containing a museum chiefly of local marine zoology. Excellent dredging. Cornish chough resident on cliffs to south and west of Island.

At Castle Rushen is a museum of insular antiquities open to the public.

Entomology.—Douglas Head, the headquarters of the moths *Dianthæcia cæsia* and *Polia nigrocincta*.

Botany of coast interesting, several south-western Atlantic forms occurring, such as *Adiantum Capillus-Veneris*, also *Brassica monensis*. Marine algæ abundant.

Bridlington Quay.

At Bridlington Quay, building, parade-making, and ornamental gardening have proceeded to such an extent that the native cliff for a couple of miles is entirely concealed. Leaving the town to the north, that is, towards Flamborough Head, the observer will be struck by the abundance of white pebbles and stones. In many places the shore is snow-white, excepting for streaks of brown seaweed. The children protect their sand castles with white stones. The difference in this feature between the Bridlington coast and that of any of our southern seaside places is most striking. At Brighton, Eastbourne, Seaford, Aldborough, &c., the stones on the shore are all greyish or brown (flints chiefly.) At Hunstanton white stones may be seen, but they are few in number, and mixed with many others. At Bridlington almost all are white. Yet the cliffs at Bridlington and Brighton are alike of chalk. The difference is in the hardness of the chalk and

in the presence or absence of flints. At Brighton the chalk is soft (Upper Chalk) and the flints numerous, thus the chalk gets washed away and the flints are left on the beach. At Bridlington the chalk is hard (Lower Chalk) and flints are almost absent, and hence it comes that the chalk itself, withstanding the action of the waves, becomes rounded into pebbles and cobble-stones, such as are now seen on the beach.

The chalk cliff itself at Bridlington is not to be seen until you have walked northwards from the town a mile and a half. If at any place short of this you climb the cliff, you have to ascend by a clay path, very dirty and slippery in wet weather. It is glacial clay, and was deposited where it now lies at a time when this part of England much resembled the condition of Greenland at the present time. If you doubt this, dig out of this clay-cliff half a dozen of the largest and hardest fragments of stone that you can find. One or more of them will almost certainly show a smoothed surface with scratches. The Bridlington shore at this spot is covered with seaweeds, chiefly of the brown kinds, and many of these are in turn covered by colonies of Bryozoa. Some of these show most beautiful patterns. Here, too, may be picked up in plenty the sea-mats (Flustra) and beautiful specimens of encrusting sponges and alcyonarian polyps.

Onwards from Bridlington to the Head the cliff is of chalk. Flamborough Head in Yorkshire pairs off with Beachy Head in Sussex; each is a short but lofty promontory of chalk, broken off so as to form a perpendicular cliff.

Filey.

Filey consists of two towns, the old and the new, both built on glacial clay, and with deep ravines separating them. These ravines are now well clothed with wood, but the observer may note that nowhere do they present anything that he would call "rock." Their banks are clay. As is now almost invariable at popular seaside places, the cliffs close beneath the town are enclosed and concealed by gardens.

&c. You can walk on the top of the cliff in each direction, either north or south, and in both directions you will be upon clay. There is a bridge over the northern ravine close to the fine old church which is the pride of Filey. In order to get a view of the cliffs you must go down on to the sand, but before doing so notice that the bay of Filey is very large, and that, looking out to sea, it is bounded on your right hand by a far-extending promontory which stretches nearly to Flamborough Head, and in which the white gleam of chalk can easily be seen in places. The boundary of the bay on the left hand is much nearer the town, and ends, after about a couple of miles, in a rocky projection known as the Brig. The sands, as in most half-enclosed bays, are extensive and flat. They are firm and have no mud. As they have no rocks so there is scarcely any seaweed and very few pebbles. Shells also are very scarce. Excepting for bathers, riders, bicyclists, and children with spades, it is not possible to imagine sands more unattractive than those of Filey Bay. If you walk towards Flamborough Head you must, if you wish to sit down, take your campstool with you, for there is not a bit of rock or a sand hillock. High tides come up to the base of the cliff, and the latter is clay. It is glacial clay, but it contains scarcely any stones, and consequently yields nothing for the shore. This glacial-clay cliff extends in this direction much further than most would like to walk. Where it ends chalk strata begin. It is in the other direction that the beauties of Filey must be sought. It is the Brig which has made Filey so deservedly attractive.

Let the observer stand on the shore half-way between the town and the Brig, and look toward the latter. On his left hand are the clay cliffs, but coming out from under these, straight before him, he will see a level line of a totally different structure. It is a hard rock arranged somewhat in layers, and presenting a series of little excavations caused by the sea. Although running almost horizontally, it yet rises a little to the right, that is, towards the Brig. It is nowhere,

perhaps, more than twenty feet high, and upon it rests (the distinction between the two being as abrupt as possible) a great mass of clay cliffs. The latter are more than a hundred feet in thickness and look all alike, that is, there is no trace of layers.

This clay is again the glacial clay, comparatively a quite recent deposit, and having no relation whatever in point of time with the hard sandstone rocks on which it rests. The latter were formerly covered with chalk in great thickness, which, however, was wholly removed before the clay was deposited on the denuded surface. The spot where the rock emerges from under the clay makes a sort of angle, and compels us to turn to the right. Soon we find ourselves walking not on sand but on rock, the latter being in many places fairly level. We are now on what is technically known as an Oolitic stratum, below both chalk and greensand. It contains abundance of fossils, but it is so hard that they are not easy to get out. Passing onwards, on to the Brig itself, we find that it is made up of similar rock, which slopes a little downwards towards the south and the east and presents abrupt ledges to the north-west. It is well to remember that this is the general slope of all the strata in England, and that, as a consequence, when you pass to the west and north you are constantly leaving strata of recent formation and going on to those which are much older. This lesson will be strengthened by turning the corner of the cliff at the foot of the Brig, looking towards Scarborough, and observing that the strata now gradually slope upwards. The masses of broken rock which lie about the foot of the Brig should be looked at. Some of them will be seen to present in very conspicuous demonstration the peculiar branching concretions which have so much puzzled geologists in the cliffs at Hunstanton. Respecting these there has been and still is much doubt as to whether they represent organisms or are merely the results of concretion from water.

Having turned the corner of the Brig, and walking past

what are called the caves, some peculiar appearances will be observed in the face of the rock. Large isolated oval or almond-shaped concretions of a slaty grey rock are embedded in the sandstone. As we pass further on these masses change in character somewhat, and they finally become occupied by excavations, and look much like slag from an iron-foundry. They are what are known as Septaria, and their forms and peculiar conditions are well worthy of notice.

The attractions of Filey Brig to the marine botanist and to the lover of beauty, as presented by seaweeds growing in clear water, are very great. Nowhere can rock pools be inspected to greater advantage. It would require, however, a long chapter by itself to do any sort of justice to this part of the subject.

Hunstanton.

Hunstanton is famed for its *red* chalk, and a photograph of its very remarkable cliff forms the frontispiece of Woodward's work on the Geology of England and Wales. It is not, however, solely for this cliff that it is an attractive place for the naturalist. The shore supplies a considerable variety of shells, seaweeds, and crustaceans. When the tides are good and go down low, an interesting area of forest-bed is laid bare. From this bed is said to have been obtained a stone implement impacted in a portion of a tree, thus proving the existence of man at the time of the growth of the forest. A few more such specimens would be very valuable. A little way inland, between the railway station and the gas-works, there is a very interesting gravel quarry. In this quarry may be studied to great advantage alternating layers of clay, gravel, and sand, resulting, there can be little doubt, from Glacial or Inter-glacial action. It was in this quarry that human bones were found three years ago under conditions which suggested, but which could not be considered conclusive, that they were those of a prehistoric man. Near to this quarry, a little further inland, at several places the

White Chalk is exposed by cuttings. The sand strata which belonged to the quarry just mentioned dip rapidly toward the sea, and as the sea no doubt has receded considerably in the whole district of the Wash, it may be matter of question whether the whole of the mass in which the quarry has been excavated was not deposited from the sea-beach rather than deposited by inland glacial action. This supposition would by no means exclude the idea of some share having been taken by icebergs.

One of the most interesting features of the Hunstanton cliff—that is, the cliff between the new and the old towns—is that it presents such splendid sections of different strata lying horizontally and conformably one upon the other. Even the most unobservant cannot fail to be struck by the lessons here taught. We see how the chalk ends, and what strata come beneath it, and how the latter are again replaced by others.

Geologically we have to do with Chalk, Upper Greensand, and Gault, but about the latter there is still some doubt. Many fossils may be obtained in good condition from the chalk, but it is hard rock, and their cleaning requires patience. A peculiar feature, which must not escape observation, is the existence, on the surface, of great branching ridges almost like stag's-horns laid on the flat. These have been supposed to represent the remains of sponge, but their true nature is still a matter of some doubt. We have noted their occurrence also in the rocks at Filey Brig.

Brighton.

Chalk downs, chalk cliffs, and flint stones out of the chalk characterise Brighton. Choanites from the shore are often polished, and as "Brighton pebbles" afford beautiful objects.

There is a Museum which contains many objects of great interest and has been much developed of late years. It is rich in Brachiopods and has usually a botanical Vivarium. A visit to a special museum of beautifully mounted birds on the road to the Dyke should not be missed.

Aldborough.

A long, monotonous steep beach covered with rolled stones having no rocks and but little sand gives the feature of this coast. What sand there is, is seen only at low water. Sea-birds, especially of the wader tribes, are abundant, and, in the breeding season especially, afford much interest to the observer. At Orford and many other places sand quarries may be examined in which fossils, especially corals, are abundant and easily obtained. Here and at Southwold sea-fishing by throwing in the line is attractive to many. The air, as along the whole of the east coast, is very invigorating.

Felixstowe.

With Felixstowe we may for the present group Clacton and Walton-on-the-Naze. They are all within reach of Ipswich, where there is a well-arranged and attractive Museum. The corals and other fossils of the Crag formation may be found at many spots where digging has occurred, sand quarries and the like. At all these three Resorts the modern development of the town has for the most part concealed or destroyed the geological attractions of the cliffs themselves, and local guidance may be needed in order to find good places for geological work. There is an excellent Guide-book published at Felixstowe by the District Council, which contains a good account of the Geology, Natural history, and Botany.

Seaford (near Newhaven).

Seaford offers perhaps unequalled attractions to the young geologist in search of Chalk fossils. The Chalk is abundantly exposed, very frequently broken and tolerably soft. Echini, bivalves and all the characteristic fossils of the Upper Chalk may be obtained easily and in great perfection. The formation of tabular as well as nodular flint may be studied to great advantage and on a large scale. As might be expected, the beach is bounded by a vast bank of flint stones and pebbles of all sizes. Very few birds and very few shells.

Weymouth.

Weymouth has a fine beach and it is near to Dorchester and the Isle of Portland. At the former there is an excellent Museum, rich in prehistoric archæology, and at the latter, fossil trees may be seen on an unequalled scale. They are too big and heavy to be brought to museums and must be inspected *in situ*. The quarrymen are constantly bringing fresh ones to light, and they are practically indestructible.

Lyme Regis and Whitby.

Lyme Regis is geologically the Whitby of the south coast, and both places present almost unparalleled attractions to the naturalist. What Lyme fails to secure in comparison with its rival as to salubrity, it fully makes up for in the superior attractiveness of its Lias Cliffs. It is the paradise of the fossil-seeker. Falls of cliff are frequent and remains of ichthyosauri, &c., &c., &c., may be had at any time for the trouble of carrying them home. Whitby has its Lias, too, but its cliffs are harder and less accessible than those of Lyme. The Botany, the fish and the zoophytes are good at both. There is a Museum of old standing and much interest at Whitby, but none at Lyme.

At some future time we hope to find room for more detailed notices of several of the places which we have here mentioned very briefly and some of the many which we have wholly omitted. For the present the west coast and much of the south, as well as the whole of Scotland and Ireland must be left aside. Many of the places in these possess as regards marine zoology far superior attractions to those in the east which we have above described. The Cornish coast for shells, Tenby and Ilfracombe for zoophytes, and the Irish coast for crustacea are well-known to all naturalists. We very reluctantly leave for the present their glories undescribed.

A MARINE AQUARIUM.

It must often be a subject of regret to sojourners by the seaside that, on returning home, they have to leave behind them the interesting, and often beautiful, forms of marine life, the observation of which in their natural abode has added so much to the enjoyment of a holiday on the coast. There is no reason why many of these creatures should not be taken by the traveller to his home and established there, to be a source of perennial interest. He must be careful in the selection of his objects, and on his first venture let him content himself with some hardy sea-anemones; a common starfish or two (of very small size); two or three mussels with clean, smooth shells, and half a dozen periwinkles.

The success of the experiment will depend largely on the self-control exercised by the collector. There are many other interesting animals which he may appropriate later on, but he must be content with the small beginning here indicated.

The sea-anemones must on no account be forcibly removed from the substance to which they are found adhering, but a small piece of the rock or chalk must be chipped off without disturbing the base of the animal.

All the animals mentioned can be carried in a tin or wooden box and packed in damp seaweed so that they shall not be bruised in transit. The weed used for packing is to be thrown away, but the collector must secure some small, healthy plants of green algæ (*Ulva* and *Enteromorpha* are the best) attached to clean shells or stones, without any incrustation upon them. The plants must be handled tenderly, as their attachment is of the slenderest, and if separated from the shell or stone they will not thrive. These may be taken home in a wide-mouthed pickle jar, and must not be allowed to get dry. The collector had better take a gallon or so of fine shingle washed quite clean, and a few stones varying in size from a hen's egg to a cricket ball—the more irregular

these are in outline the better—but they must be quite clean and free from marine growths or incrustation.

Lastly, a stone jar or bottle, of the largest size obtainable, may be filled with clear sea-water which a boatman will obtain far out from the shore. This is important, as shore water is not sufficiently pure. As in everything connected with this experiment, scrupulous cleanliness must be secured both as regards the bottle and its bung.

On reaching home, a suitable vessel will have to be found. A large bell glass with a proper support will serve; or, better still, a large earthern pan glazed inside.

The shingle should be rinsed in half a pint of the sea-water, which need not be thrown away, but left to clear for subsequent use. Now place the shingle at the bottom of the vessel, with the larger stones and the plants of *Ulva*, &c. Pour in about half the quantity of the stock of sea-water, not direct from the large bottle, but gently, by means of a jug, letting the water fall on to a plate or saucer so as not to disturb the bottom.

Presuming that the water is seen to be bright and clear, the animals may at once be introduced; but let them first be rinsed in a little sea-water. If the vessel is of glass it must not be placed in front of a window, or, if so placed, the side next the window must be shaded with paper of a blue tint. Light should fall only on the surface of the water, and direct sunshine must be avoided. A window facing north is the most suitable position. In a few days, if all goes well, the remainder of the sea water may be carefully poured into the marine aquarium which we have thus established. If the venture is successful, and if, as the weeks roll on, the sea-anemones remain attached to the stones, with their discs expanded, and the plants remain green and healthy—even though the starfish, and perchance a mussel, may have died—we may add more animals of a similar kind, but of choicer varieties.

In time we may try a few swimming creatures. A

friend living by or visiting the seaside may send us two or three lively prawns; or perhaps blennies or gobies from the rock-pools on the shore.

These must be introduced with caution and watched daily. Any dead animal must be removed immediately, and directly the anemones show signs of failing vitality, or the water loses its brilliancy, we must remove some of the creatures so as to restore the balance, and the life of the aquarium must be revived by supplying oxygen. This may be done by means of a glass or vulcanite syringe, and by agitating the surface of the water with a stick.

If necessary the depth of the water must be reduced for a time. The water taken out should be placed in a shallow vessel so that a large surface may be exposed to the atmosphere. It will soon become bright, and may then be returned to the aquarium. These expedients for supplying oxygen to the water, although always useful, should not be necessary in a well-balanced aquarium.

The principle of compensation which renders it possible to keep animals in a healthy state *without change of water* requires a careful adjustment of animal and vegetable life in such proportions as will ensure the healthy existence of both. The carbonic acid gas given off by the animals is taken up by the plants, which, *under the influence of light*, decompose it, appropriating the carbon to their own use and setting free the oxygen, which is taken up by the water and rendered again available for respiration by the animals.

It has already been pointed out that light is essential to the well-being of an aquarium, but if too much light is allowed to fall on it the result will be a rapid development of confervoid vegetation which will soon render the water green and in time obscure its contents. Periwinkles are useful in getting rid of conferva when growing to excess on stones, &c., but darkness is the only cure for the green opacity of water loaded with minute vegetable organisms. Temperature is another important element of success or

failure. This will be evident when it is considered that the temperature of the sea ranges only from about 40° to 65°. Practically it is impossible to keep the temperature of private aquaria within these limits, but by shading in hot weather, and covering with wet cloths much may be done to keep down excessive heat. The evolution of oxygen from plants is not the only natural means by which the water can be maintained in a condition fit for the support of animal life. The contact of the atmosphere with the water is an important means to this end in the natural world, and it is essential that in the aquarium *the area of water surface should be large in proportion to its depth.* For this reason the earthen pan suggested above is a more scientific vessel than the commonly used bell glass which, as a rule, is too deep in proportion to its breadth.

The aquarium should be covered with a sheet of glass in order to check loss by evaporation as well as to protect the water from dust. This cover will not fit so closely as to prevent the admission of air for surface oxygenation, and there will still be a loss of water by evaporation. This must be made good by the addition from time to time—and in small quantities—of clear rain-water.

The anemones will require to be fed by hand about once a week. Small pieces of oyster or mussel must be placed on the tentacles of each anemone, and if the animal be hungry, the morsel will speedily be conveyed to the mouth in the centre of the disc and will disappear. If it remains long on the disc or is allowed to roll off it must be removed. A pointed stick serves to adminster the food, and a dipping tube of glass of rather less than half-an-inch diameter is used for removing any uneaten or undigested morsels. If particles of dead animal matter remain in the tank, the water will lose its brightness, and an increased quantity of oxygen must be forced in by means of the syringe already referred to.

Sibert Saunders.

NOTES ON EATABLE BRITISH FISH.

At the present day the list of British fishes used as food is made up almost entirely of marine fishes: Eels, Salmon and Trout being almost the only fresh-water fishes that are considered palatable. This arbitrary choice, when we come to reflect on the matter, is an outgrowth of modern civilisation, of railways, and cheap transport, and lastly is governed by the fact that we live on a island, and that a small one.

By way of proving this contention it will be sufficient to show that in the olden days, when travelling, even in this country of small distances, was both difficult and dangerous, fresh-water fishes were highly esteemed as food, as witness the "stews" constructed in the grounds of old monasteries and manor-houses remote from the sea. To-day, the cultivation of fresh-water fishes, save of salmon and trout, has fallen into disuse; and this because the sea furnishes an abundant supply which can be readily transported throughout the length and breadth of the land at a comparatively small cost.

The ease with which sea fishes can be captured in large quantities and distributed throughout the country has thus killed the industry of pisciculture inland; and when this died, the taste for fresh-water fishes, Carp, Perch, Tench, Roach, Pike, and Chubb, died out, so that to-day we speak of them as "Coarse fish," fit only to provide sport for the angler. That this is to be regretted there can be no doubt, but the fact remains. On the Continent the case is otherwise; for fresh-water fishes of all kinds are still in high repute, and their cultivation affords remunerative employment to thousands. Some day perhaps we shall awake to the fact that after all "Coarse fish" are not only tolerable but even pleasant to the palate. And this revival may be brought about by the fact that, through greed and short-sightedness, we shall have made sea fishes so rare that only the wealthy among us will be able to afford them.

Nevertheless, at present, the list of what have been called "marketable marine fish" is a large one; may it ever remain so. To attempt, within the limits of a short sketch, to give anything like a complete survey of all the marine fishes which are edible, or even of those which are prized as food, would be impossible. But a few facts concerning the more valuable should be welcome. Let us briefly trace, then, the life-history of the Herring, and its kind, the Cod tribe, and the "flat fishes," since these even in their youngest stages are to be met with by those who will take the trouble to look for them during the summer sojourn at the seaside.

Probably few of my readers know that there are several distinct races of Herrings, whose habits differ markedly one from another, not only in their choice of food but also in the period at which they lay their eggs and the places where they lay them. Thus the herrings of the East and West Coasts of Scotland are known as "Winter herring," and they approach the coast during the winter months for the purpose of spawning, the fish laying their eggs on stones and gravel at the bottom of the sea, the eggs adhering to the ground by reason of the fact that they are enveloped in a sticky outer coat. Each fish lays between 20,000 and 50,000 eggs, the higher number being laid by the older fish. "Summer" herrings are more plentiful, and give rise to more abundant fishing. But no less than sixteen races of herrings are distinguished by experts, some of these spawning far out at sea, in deep water, and others near the shore, or at the mouths of rivers where the water is brackish. When the young fry have begun to grow they form the principal food of a host of enemies, including man himself, who regards them, under the name of "White bait," as an especially choice delicacy. Young sprats, by the way, make up no inconsiderable proportion of these "White bait."

The Cornish Pilchard fishery will doubtless be watched by many interested in the harvest of the sea, during their summer holidays, but it may not generally be known that

the "Sardine" of our breakfast tables is only the young Pilchard.

The Anchovy and the Shad are also members of the Herring family, and those who keep a good look out for them may meet with both, though the former is by no means common.

Young Sprats, by the way, may be distinguished from young Herrings by the fact that the belly of the former has a row of saw-like scales along its whole length, these being wanting in the herring.

No less than eighteen distinct species of Flat fishes are to be met with along our coasts. For convenience they are divided into four groups :—

(1) Species with the eyes on the right side, the mouth at the end of the snout, teeth most developed on the blind side: Plaice, Flounder, Dab, "Witch," and Lemon Dab.

(2) Species with eyes in the right side, mouth large and jaws similar on the two sides: Halibut, Long rough Dab.

(3) Species with eyes on right side, snout projecting beyond jaws, front margin of head curved, jaws larger on lower side, teeth only on that side, a "beard" of short projections from skin on lower side of head: Sole, Lemon Sole, Thick-back, Solenette.

(4) Species with eyes on left side, mouth large, at end of snout, and teeth and jaws equal on both sides: Turbot, Brill, Megrim, Scald-back, Common Top-knot, One-Spot Top-knot, Norwegian Top-knot.

Of these eighteen species only the solenette, scald fish, and the three top-knots are not used as food.

During "long-shore" fishing, and in the nets of the "shrimpers" the young of these flat fish are taken in swarms. And those who are not uninterested in the problems of the coloration of animals would do well to secure specimens and place them in shallow dishes of clean water containing a liberal supply of shingle and sand. Thus they will be able to see for themselves how marvellously these little creatures resemble their surroundings, and how, with curious undula-

tory wriggle they manage after they have been disturbed to cover themselves with sand, leaving only a part of the head and eyes exposed. But during the still earlier stages of development these fishes were all of the typical fish-like form, and had an eye on each side of the head. The manner in which these eyes move round, till both lie side by side on the right or left side of the body, as the case may be, is one of the wonders of animal life, for it must be remembered that what most people regard as the *back* of the sole, or plaice, is really its side. The reason why the two sides are differently coloured is to serve the ends of protection, the exposed upper surface being coloured to resemble the ground on which the fish is resting; but the white under surface has a purpose too, and also protective; since, when the fish is swimming, this under surface, being in shadow, is not, from its white colour, so conspicuous as a dark surface would be, so that the attention of enemies from below is not attracted when it becomes necessary to remove to fresh fields and pastures new!

The Cod-family, Mackerel, Blennies and Weaver-fish will all be met with. A word as to "Weavers," beware of them, for they can inflict a most painful and poisonous wound. And this they do by means of a spine in the back-fin, or by a similar weapon on either side of the gill-plates. But more of this subject, and of fishes of all kinds, you may learn from a (my) little book, "The Story of Fish-life," published in Newnes "Useful Library Series" at one shilling.

W. P. Pycraft.

SEASIDE BIRD-LIFE IN AUGUST.

At this season a low, sandy coast affords more variety and interest in its bird-life than a rocky one would do; a southern or western coast does not present the same abundance of birds as an eastern one. It must be remembered that in August the autumn migration of many species that follow coast-lines is just beginning, whilst many localities where sea-birds have abounded since April or May are now being rapidly depleted as the young and their parents are dispersing far and wide until next spring. Other birds begin in early autumn to resort to the coast from more or less inland breeding places. With these few preliminary remarks we will now proceed to note the various species that may, with more or less certainty, be found upon the coast in August.

For many months a flat, sandy, or muddy coast presents little of interest to the ornithologist. Such districts are common enough on the eastern coast-line of England, from the Humber southwards, and along the English Channel in places, especially about the various estuaries and so forth. But few species frequent them in summer. Here and there in the more secluded districts the pretty Ringed Plover[1] may be watched daintily running over the wet sands, and now in family parties. It is about as big as a Thrush, with a broad white collar and underparts, black breast and cheeks, and grey-brown upper parts. Here and there colonies of Lesser Terns[2] have their summer quarters upon the shingle; this species is the smallest of the British "Sea Swallows," and like all the rest is grey above (except for a black crown) and white below. The Oystercatcher[3] is more local on our southern beaches, but widely dispersed over most of the northern ones; a curious, noisy, and excessively shy bird,

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[1] *Ægialitis major.* [2] *Sterna minuta.* [3] *Hæmatopus ostralegus.*

with black and white plumage and orange-coloured bill and pink legs. The birds most popularly associated with the seaside are, however, the Gulls; but even these are local during summer, resorting to scattered breeding stations that have been so used for time out of mind. By August, family duties are nearly over, and the Gulls then become much more widely dispersed. The most ubiquitous British species is undoubtedly the Herring Gull.[1] It may readily be identified when adult by its large size and pale grey mantle. The Lesser Black-backed Gull[2] is about the same size, but when adult has a dark slate-grey mantle. It is also much more local, not nesting anywhere east of Cornwall or south of the Farne Islands. In August it begins to spread along the coast into less rock-bound districts. Then there is the misnamed "Common" Gull,[3] about half the size of the last-named species, and with a similarly dark mantle; but it breeds nowhere in England now, and only visits that part of the kingdom during autumn and winter. The Kittiwake[4] also affects rocky coasts only during the nesting season, and is consequently a local bird; but in autumn it wanders far and wide, and for the remainder of the year is one of the most widely dispersed of British Gulls. It somewhat resembles the Common Gull, but has a paler mantle and dark legs and feet. Lastly, we may mention the Black-headed Gull,[5] the smallest of the strictly British species, which is characterised by its sooty-brown hood. This peculiarity is, however, lost in August, not to be reassumed until early in the following year. Apart from its small size this Gull may be easily recognised by its red bill and legs. Not including the Great Black-backed Gull,[6] which is too local to be considered in the present article, all the five species here enumerated may be looked for with tolerable certainty on all parts of the coast during August. Many young Gulls of these species will also

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[1] *Larus argentatus.* [2] *Larus fuscus.* [3] *Larus canus.*
[4] *Larus tridactylus.* [5] *Larus ridibundus.* [6] *Larus marinus.*

be seen. These may always be distinguished by their mottled brown plumage, for it is only when fully adult (and after several years in some cases) that the pure white and grey dress of maturity is gained. The aerial gambols of these pretty birds afford constant pleasure and amusement to the seaside visitor. Gulls are *par excellence* the birds of the seaside. Their persistent following of the shoals of fish, their attendance at the quays and harbours where boats are unloading fish, their assembling in large flocks on the bare sands and reefs at low water—are all of interest, and lend that touch of life to the shore which impresses itself on even the most casual observer.

From time to time in August, too, flocks of Terns may be watched just off shore, leisurely making their way southwards with their young from the northern breeding stations. Terns are smaller than Gulls, more slender in appearance, with longer and forked tails, the outer feathers being very narrow and much elongated, like those of a Swallow. These birds obtain their food in a different way from the Gulls. The latter hover above the water and swoop down upon an object or flutter above it until it is seized; but the Terns poise and hover like a Kestrel, and every now and then drop like a stone into the sea to secure a tiny fish. Their shrill clicking notes are also very characteristic. Five species breed in our islands, and of these the Sandwich Tern[1] is the largest, and its tail is not so long or so acutely forked. The Common Tern[2] is distinguished from the Arctic Tern[3] by its white underparts; in the latter these are grey, as is the mantle of both, whilst each has a black hood. The Roseate Tern[4] is too local to require more than passing notice here, but may be identified by its roseate under surface and white inner margins to the primaries. The Lesser Tern has already been noticed. All the Terns spend most of their time in the air, seldom walking. They all have remarkably short tarsi, and all are migratory.

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[1] *Sterna cantiaca.* [2] *Sterna hirundo.* [3] *Sterna arctica.*
[4] *Sterna dougalli.*

Other common Sea-birds that the visitor to almost every part of the coast in August will meet with are the Cormorant[1] and the Shag,[2] and one or two species of Auks, such as the Guillemot,[3] the Razorbill,[4] and the Puffin.[5] The big black-looking Cormorants and Shags may either be seen basking on the rocks with wings outstretched—hanging out to dry, as it were—digesting the fish with which they have lately gorged themselves, or swimming along, not very far from shore, diving at intervals. Sometimes, especially at nightfall, parties of these birds will be noticed in swift yet laboured flight just above the waves, going to some favourite roosting place, a sea cave by preference. The Razorbill, the Guillemot, and the Puffin are all black and white birds of moderate size, the first named recognised by its black, deep bill, crossed by a white line; the second, the same in size, but with a long, narrow, pointed bill; and the last by its small size and enormous coulter-shaped bill. All are expert divers, and spend almost the whole of their time in the water in quest of their finny prey. They, too, may frequently be watched flying just above the sea in long skeins or strings.

By far the most interesting and absorbing feature of bird-life on the coast in August is that pertaining to the wonders and the problems of avine migration. There are few localities on the shore where the wondrous drama of migration is not in progress in August. The vast return tide of feathered life is just commencing to flow along the coast-lines southwards; the army of birds of many species that breed far away in the Arctic Regions is now sending forth its extreme advance guards—the pioneers of an advancing host that each successive day is now bringing closer and closer to us. The most favourable points for observation, however, are the sands, the shingles, and the mud-flats and saltings on the lower-lying coasts Here in the early days of August the first Knots[6] make their

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[1] *Phalacrocorax carbo.* [2] *Phalacrocorax graculus.* [3] *Uria troile.* [4] *Alca torda.* [5] *Fratercula arctica.* [6] *Tringa canutus.*

appearance in parties, some of them, be it remarked, little more than nestlings, hatched but a few weeks ago on the barren lands of the Polar Basin. The Purple Sandpiper[1] is another arrival at this season from the far north; whilst Dunlins,[2] Redshanks,[3] Sanderlings,[4] and Ringed Plovers (from Northern Europe) in family parties and larger flocks, also help to increase the number and variety of bird-life on the coast. Here and there wary Curlews,[5] Godwits,[6] and in greater plenty Common Sandpipers[7] (one of the very earliest of autumn migrants) appear, to remain for the winter or to pass on in a short time to more southern latitudes. Parties of Terns go by at intervals. It is yet too early for the Arctic Ducks and Geese; but odd Divers and Grebes occasionally make their appearance now.

But interest does not entirely centre in strictly littoral species. There are many land birds that are now quite a feature of bird-life on the shore—migrants following coast-lines and ancient routes towards the sunny South. During the first half of August especially, the autumn migration of the Swift,[8] is in full swing, and the birds should be looked out for, especially along the eastern and southern seaboards. It is yet a little too early for the Swallows and the Martins,[9] but various small migratory land birds are sure to be seen. The Wheatear[10] will be one of them. This dainty bird is one of spring's first harbingers, as it is one of the first of autumn's heralds. Odd birds here and there are now migrating along the shore southwards. It is not the province of this article to say anything about land birds; but there is one, the Rock Pipit,[11] which deserves mention. It is exclusively confined to the coast, and its complaining *tweet* is sure to arrest attention as the little olive-brown bird, with spotted breast, hops and flits restlessly about the rocks and the shingle on

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[1] *Tringa maritima.* [2] *Tringa alpina.* [3] *Totanus calidris.*
[4] *Calidris arenaria.* [5] *Numenius arquata.* [6] *Limosa rufa.*
[7] *Totanus hypoleucus.* [8] *Cypselus apus.* [9] *Hirundo: Chelidon, Cotyle.*
[10] *Saxicola œnanthe.* [11] *Anthus obscurus.*

all our precipitious coasts. Finally, I would say that a good field glass is indispensable to the bird-watcher by the sea in August.

CHARLES DIXON.

SEA-SHELLS AND THEIR OCCUPANTS.

ONE of the greatest delights of many who make annual visits to the sea is the collecting of specimens from the shore. Shells are always especially sought after. Well-illustrated works on British marine conchology are expensive. The great work of Gwyn Jeffreys published more than thirty years ago still keeps its place as the standard work; equally valuable is Forbes and Hanley's "History of the British Mollusca" of fifty years' antiquity. It is from this latter work that the appended plates have been selected.

We do not for a moment deprecate mere collecting, but would emphasise that the observation of the life-cycle of a single species is of infinitely greater interest, and has far greater intellectual value, than concerning one's self, during the seaside holiday, with collecting as many different sorts of shells as possible.

Such questions as the probable origin of molluscan life, the influences of environment upon the shape and colour of shells, also mimicry and protective coloration, may be offered to the young conchologist for investigation in the field, or, more correctly, on the shore. The following remarks will serve to indicate what we mean.

In all probability the majority of land and fresh-water mollusca are descended from marine forms which have slowly, very slowly, and during long periods of time, undergone a change in their environment, either by gradual migration or by enclosure of arms of the sea. In this connection the

mussel of our rivers and canals (*Dreissensia polymorpha*) should be compared with the common edible marine mussel. Their affinities will be at once apparent to the most casual observer. In brackish water at the mouths of tidal rivers intermediate forms may be observed. They are quite distinct from the true marine molluscs in having lungs instead of gills.

The variations in the shape of shells are directly related to the life-habits of their occupants. The Limpets frequent rocks exposed to the full onslaught of the waves, they have almost flat shells which are entirely open below. The large foot of the animal acts like a sucker, it is very strong and possessed of great adhesive power.

The common dog-whelk (*Purpura lapillus*) has a comparatively long spire and small mouth, characteristics which are especially well marked when occurring in sheltered waters, such as the Solent. On the other hand, the shells of this species from rocks, at Land's End, the Yorkshire coast and other places fully exposed to the wash of the waves, have a short spire and larger mouth; in other words they approximate, though slightly, to the limpet type of shell.

This species also illustrates the remarkable variation in colour often observable in shells of one species. The visitor to Newquay will observe that there the shells of the dog-whelk are strongly banded. These banded forms are considered by some writers to show a tendency to protective coloration, as they frequently occur on veined rocks.

The Rev. A. H. Cooke remarks[1] that "Protective coloration is not uncommon among the Mollusca. Littorina obtusata is habitually found, on our own coasts, on Fusus vesiculosus, the air-bladders of which it closely resembles in colour and shape. Helcion pellucidum, the common British "blue limpet," lives, when young, almost exclusively on the iridescent leaves of the great Laminariæ, with the hues of which its own conspicuous blue lines harmonise exactly. In

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[1] "Cambridge Natural History." Molluscs and Brachiopods, p. 69.

mature life, when the Helcion invariably transfers its place of abode to the lower parts of the stalk and finally to the root of the Laminaria, which are quite destitute of iridescence, these blue lines disappear or become much less marked."

To watch the development of a snail from the egg is of the greatest interest. Egg-capsules of the whelk, &c., should be taken home and placed in a basin or bell glass of sea-water for observation. The shell is always present at birth. Its shape should be carefully noted, for in many species remarkable changes take place. To mention two only. The cowry in the young condition is a distinctly spiral shell; as it approaches maturity the spire becomes completely hidden beneath layers of shelly matter: the common limpet has at first a nautiloid shell. We believe that we are correct in remarking that in this, perhaps the commonest of our shells, the transition stages leading up to the well-known adult form have not as yet been observed.

Notes will be given in our September issue on a sponge (*Cliona*) which bores minute holes in shells, especially oysters. It should be remembered, however, that certain mollusca also bore circular holes in oyster and other shells. Nassa and Murex are special enemies of the oyster and it is stated[1] that "Purpura lapillus prefers Mytilus edulis to any other food, piercing the shell in about two days' time by its powerful radula, which it appears to employ somewhat in gimlet fashion. If Mytilus cannot be procured it will eat Littorina or Trochus, but its attempts on the hard shell of Patella are generally failures."

The appended plates with descriptions should materially assist the young collector in the identification of his captures. For the most part, only the commonest species have been figured. The rock-borers or stone-piercers (*Pholas*, &c.) and the edible species (cockle, winkle, scallop, mussel, &c.) will be illustrated and described in a future number.

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[1] "Cambridge Natural History." "Molluscs and Brachiopods," p. 60.

The equipment of a conchologist is not expensive. Plenty of boxes (cocoa and coffee tins serve very well) for large specimens, a few corked glass tubes for very small ones, a satchel to carry them in, and a scoop with a long handle for searching pools, are all that will be required for shore work.

Opportunities may arise for using a dredge net from a boat: such should never be missed, as the best captures are always made by this method.

Shells which have been tossed about on the beach and become worn are useless. Living specimens should be obtained, if possible, but a worn shell might fill the blank in the collection until a better is forthcoming. The best time to collect is at low water. The collector will quickly make himself acquainted with the favourite haunts of the different species, he will soon learn by experience that it is useless to look for razor-shells and cockles on very rocky ground, or for piddocks in sandy places.

ILLUSTRATIONS OF BRITISH SEA-SHELLS.[1]

Spiral Shells.

Description of Plate I. See Frontispiece.

Turritella communis (Pl. I., figs. 1, 2) is one of the commonest of our native shells, and the only British representative of the genus. It is uniformly reddish-brown, or that colour in wavy stains on a livid ground; occasionally entirely white. The operculum is multispiral with fimbriated edge. It frequents muddy and weedy localities all round our coast.

The Pelican's-foot shell, *Aporrhais pes-pelecani* (Pl. I., fig. 3), is generally distributed around our shores and all the coasts of Europe. It prefers a gravelly bed, and may be dredged

[1] Names from Forbes and Hanley. Those in brackets are from the list of British Marine Mollusca, published by the Conchological Society in 1901.

alive from any depth between four and one hundred fathoms. The operculum is concentric. The remaining British species, *A. pes-carbonis*, is closely allied to the above, but is smaller and not so solid, and is very rare.

Fig. 4. *Cylichna cylindracea* (= *Bullinella cylindracea*). White and glossy. Our largest native species.

Figs. 5, 6. *Cylichna obtusa* (= *Tornatina obtusa*). Whitish or pale fulvous. Does not exceed quarter of an inch in length.

Fig. 7. *Mangelia linearis* (= *Clathurella linearis*). Whitish with brown lines on the striæ.

Figs. 8, 9. *Mangelia turricula* (= *Bela turricula*). White, or tinged rose-colour. The whorls in *M. trevelyana*, an allied species, are rounder, and a distinct labial sinus is always present.

Fig. 10. *Mangelia costata* (= *Mangilia costata*). Whitish with yellowish-brown spiral lines.

Fig. 11. *Natica monilifera* (= *Natica catena*). Olivaceous grey with flexuous markings of a chestnut colour. A white rim usually margins the whorls. Operculum elliptical with a small spire.

Figs. 12, 13. *N. nitida* (= *N. alderi*). Highly polished; ground colour variable, white, pale fawn or chestnut, with five spiral coloured bands. *N. montagni* is a smaller species, reddish flesh colour within and without, with a narrow whitish band below the suture.

Figs. 14, 15. *Nassa incrassata*. Mouth whitish with a dark spot at the base of the canal. In *N. pygmæa* the mouth is stained purplish-red. Operculum unguiculate.

Figs. 16, 17. *N. reticulata*. Differs from *N. incrassata* in the angular whorls, and in not having a dark spot at the canal.

Fig. 18. *Scaphander lignarius*. Glossy, pale orange, tawny, with deeply incised striæ.

Fig. 19. *Murex erinaceus* (= *Ocinebra erinaceus*). Brownish white. *M. corallina* is smaller, rufous or brown, with rounded unarmed ribs.

Fig. 20. *Akera bullata.* Very thin, elastic, horn colour.

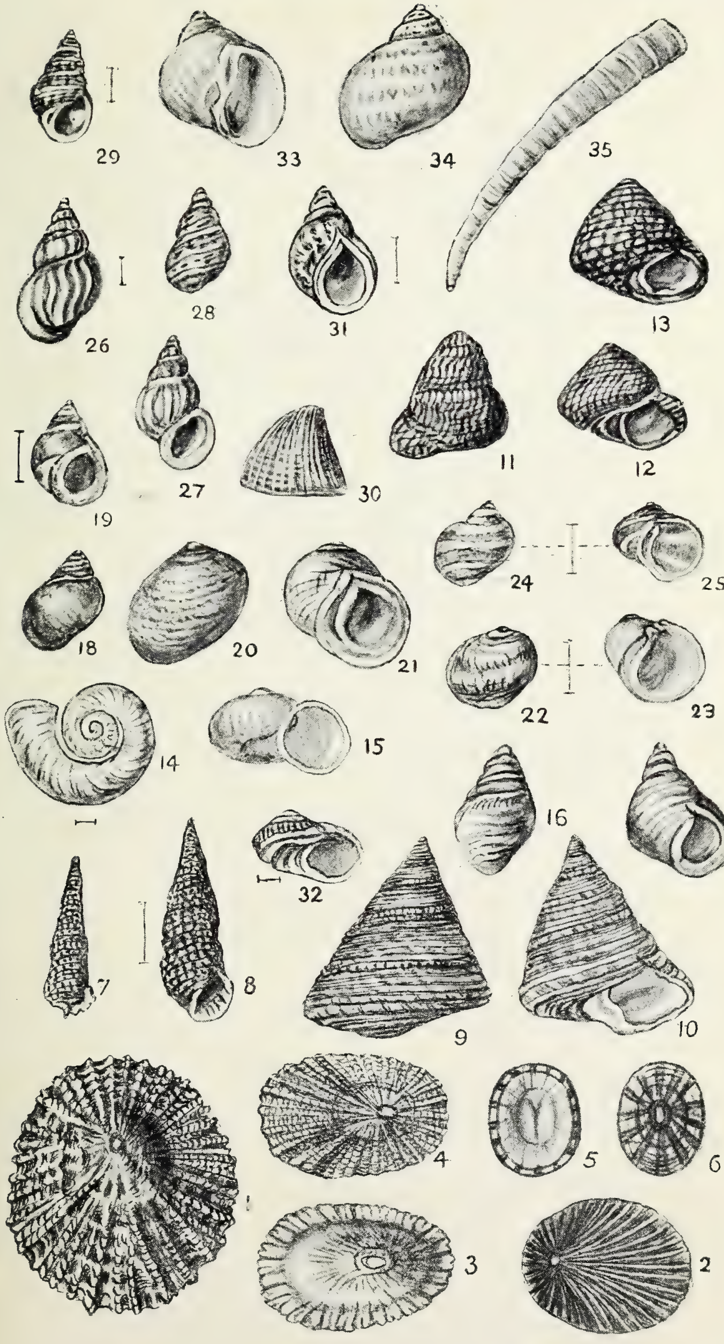
Figs. 21, 22. *Cypræa europæa* (= *Trivia europæa*). The only European cowry. Pale livid flesh colour, sometimes pure white on the base. Immature specimens are not nearly so common as full-grown ones, they were mistaken by old writers for a *Bulla*, and they somewhat resemble a *Succinea*, being white very fragile and pellucid, and having a short blunt spire of two or three whorls.

Univalves.

Description of Plate II.

Fig. 1. *Patella athletica.* Surface ribbed. It differs from the common Limpet (*P. vulgata*) in the tooth-like scales arming the ribs.

Fig. 2. *Patella pellucida* (= *Patina pellucida*). Surface smooth or nearly so, usually with bluish-green linear markings radiating from the centre. Concerning the variety *lævis*, we quote the following interesting particulars from Forbes and Hanley, vol. ii., p. 430: "The two varieties of this elegant limpet differ so remarkably from each other, as strikingly to illustrate the effects of food and habitat upon colour and solidity. The more typical *pellucida* feeds upon the leaves of the Fuci, the aberrant *lævis* upon the roots and stalks, in which indeed it is wont to imbed itself. The former is thin, semi-transparent, of a dark olive when adult, of an ochraceous yellow when young, is regular in shape, which ranges from subelliptic to rounded ovate—for, as in most limpets, the shape tapers a little behind, and is adorned with more or less interrupted linear rays of lustrous mazarine blue, that vary greatly both as to number and approximation. The latter form is a much stronger shell, very irregular in shape, yet generally pinched up, as it were, at the sides (so that when placed upon a level surface, the side margins alone touch it), of a yellow or ochraceous horn colour, with the blue rays often all but wholly obsolete, and almost invariably of a lighter tint."



British Sea Shells.

Figs. 3, 4. *Fissurella reticulata* (= *F. græca*). White, tinged with green, with about five to eight brownish-grey rays. Apex of the shell perforated in adult specimens, entire and subspiral in young ones.

Figs. 5, 6. *Acmæa virginea*. Greyish-white or horn-colour, with radiating pinkish lines. *A. testudinalis* (the "tortoise-shell" limpet) is variegated or reticulated with brown and white.

Figs. 7, 8. *Cerithium reticulatum* (= *Bittium reticulatum*). Brown, solid, ornamented with tubercles. Operculum spiral corneous.

Figs. 9, 10. *Trochus zizyphinus* (= *Calliostoma zizyphinus*). Yellowish flesh colour, or reddish-brown, with pinkish-red blotches or flame-shaped markings.

Figs. 11, 12. *Trochus cinerarius* (= *Gibbula cineraria*). Ash colour, with transverse iron-grey lines.

Fig. 13. *T. umbilicaris* (= *G. umbilicata*). Greenish-white or yellowish, with purple-red stripes.

Figs. 14, 15. *Skenea planorbis*. Pale olivaceous, or reddish-brown. Minute, hence often escapes notice.

Figs. 16, 17. *Littorina rudis*. Smaller than the "periwinkle," from which it also differs in the rounded whorls. All members of the genus have a pyriform corneous operculum.

Figs. 18, 19. *L. neritoides*, more or less black, generally dull and eroded.

Figs. 20, 21. *L. littoralis* (= *L. obtusata*), Solid, flattish; colour, variable, yellow, rufous or brown, sometimes banded.

Figs. 22, 23. *Lacuna pallidula*. Thin, whitish, with a dull yellow epidermis.

Figs. 24, 25. *L. puteolus* (= *L. parva*). Body whorl, banded white and chocolate-brown; apex sometimes violet. Epidermal covering yellowish horn colour. *L. vincta* (= *divaricata*) is oblong-conical, with many minute spiral lines on the body whorl.

Figs. 26, 27. *Rissoa parva*. Distinct in the curved and oblique chestnut-brown line on the upper corner of the outer lip. Ground colour very variable.

Figs. 28, 29. *R. semistriata* (= *Cingula semistriata*). May be known from allied species by its shortness and solidity. Whitish or fulvous, with elongated or square spots arranged spirally. *R. inconspicua*, another common and variable species, is smaller, uniformly glossy-white, or streaked with red.

Fig. 30. *Emarginula reticulata* (= *E. fissura*). White within and without. *E. conica* (= *rosea*) of our southern coasts differs in the greatly recurved apex. *E. crassa* is larger than either of the preceding, and is rare.

Fig. 31. *Phasianella pullus.* The most brilliantly coloured of all our native shells. Purplish-rose, crimson-red or brown, with variable spots and wavy lines.

Fig. 32. *Adeorbis subcarinatus.* Entirely white. Operculum circular, flat, multispiral.

Figs. 33, 34. *Velutina lævigata. Natica nitida.* This species, which also appears in Plate I., figs. 12, 13, has, through an unfortunate error, been reproduced here.

Fig. 35. *Dentalium entalis.* Porcelain-white, not striated. *D. tarentinum* (= *vulgare*) is a smaller species, distinguished by the fine striæ on the posterior end.

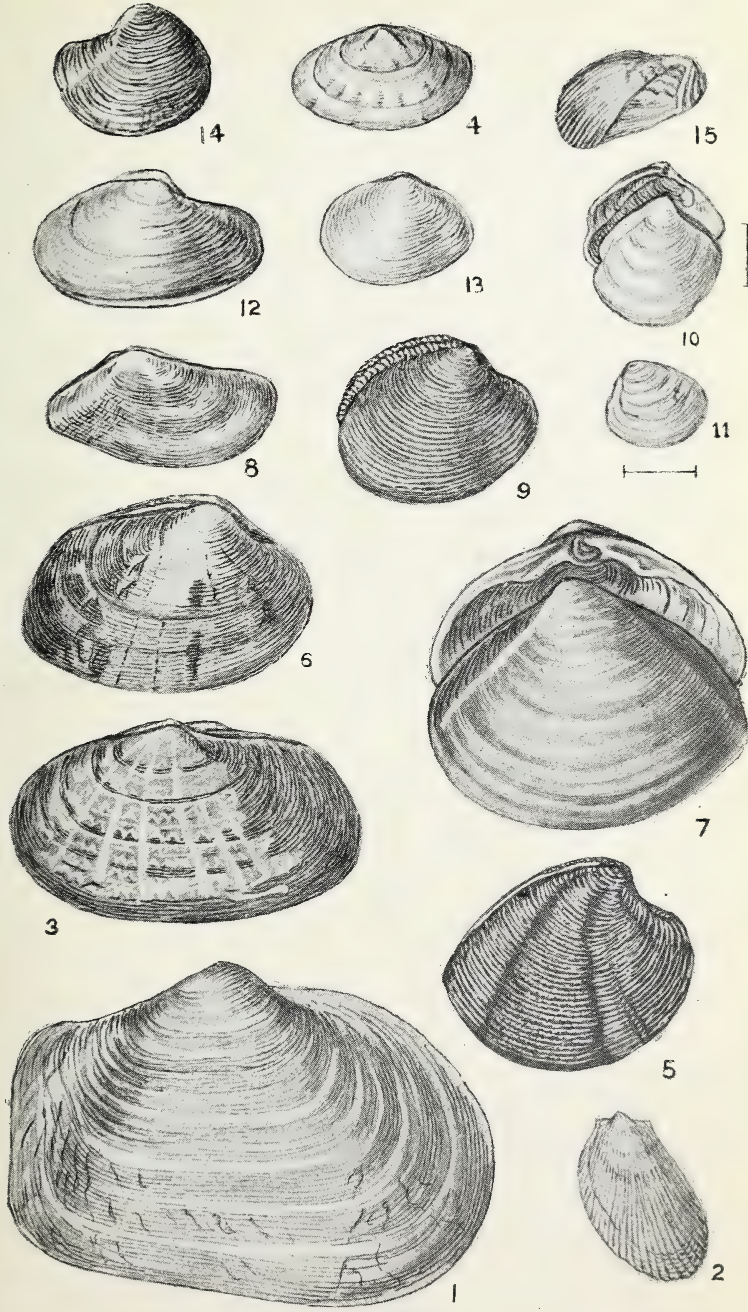
Bivalves.

Description of Plate III.

Fig. 1. *Mya truncata.* The whitish shell is covered uniformly with a loose yellowish-grey epidermis. *M. arenaria*, the only remaining British species, is larger, the epidermis is ash colour, and the valves are not infrequently stained black.

Fig. 2. *Lima Loscombi.* Pure white, delicate, fragile, *L. hians* is much larger, less translucent, and often stained brown in adult specimens.

Fig. 3. *Psammobia vespertina* (= *P. depressa*). "The Setting Sun." "The colouring consists of numerous alternate rays of carnation or livid pink and white, the preponderance of each hue varying in different examples." *P. ferroensis* is closely striated with raised concentric lines.



British Sea Shells.

Fig. 4. *Psammobia tellinella.* Smooth, not distinctly rayed. Is more or less tinged with purple within and without.

Fig. 5. *Venus striatula* (= *V. gallina*). Colour variable, usually whitish with chestnut-colour zigzag markings and three rays. *V. fasciata* is usually marked with three or four orange rays on a whitish ground; *V. ovata* is rufus flesh colour, rayed with numerous narrow ribs.

Fig. 6. *Tapes pullastra.* Dull chalky white with angular spots and zigzag markings of a livid brown. *T. virginea* is white, but often crowded with pinkish zigzag lines.

Fig. 7. *Mactra solida* (= *Spisula solida*). Solid, glossy, white under the ash-coloured epidermis. *M.* (*Spisula*) *elliptica* is a closely allied species, but is smaller, less solid, and is not grooved concentrically on the dorsal areas. *M.* (*Spisula*) *subtruncata* is whitish, whilst *M. stultorum* (a very common and variable species) is fawn colour with narrow rays.

Fig. 8. *Donax anatina* (= *D. vittatus*). Lined lilac beneath a glossy yellow epidermis. *D. politus* is "angularly mottled with liver colour or rich brown, varying much in intensity of hue. A single, rather broad, conspicuous ray runs from the beaks."

Fig. 9. *Lucina spinifera.* Uniformly dull white. *L. borealis* is larger, and the concentric striæ do not become spinous.

Fig. 10. *Lucina flexuosa* (= *Cryptodon flexuosa*). Very thin, almost pellucid, within and without a pure or bluish-white. *L.* (*Loripes*) *lacteus* is opaque white, without sculpture and without an external ligament.

Fig. 11. *Nucula nucleus.* White, covered with an olivaceous epidermis. *N. nitida* has a shiny ash-coloured epidermis, and is often ornamented with dark grey linear rays. *N. tenuis* is thin, fragile and smooth.

Fig. 12. *Thracia phaseolina* (= *T. fragilis*). Very thin, brittle; snow-white with yellowish epidermis.

Fig. 13. *Syndosmya alba.* Very thin and fragile, white. *S. prismatica* is very inequilateral, and much elongated and compressed.

Fig. 14. *Corbula nucleus* (= *C. gibba*). Valves remarkably unequal, the larger marked sometimes with pale crimson rays; the smaller always with a thick umber-brown epidermis.

Fig. 15. *Crenella discors* (= *Modiolaria discors*). Very thin and fragile, epidermis various shades of green and olive. *C.* (*Modiolaria*) *marmorata* is more or less painted with minute linear angulations of a liver colour upon a pale or whitish ground. Epidermis green and shining.

Bivalves.

Description of Plate IV.

Fig. 1. *Cyprina islandica* (= *Arctica islandica*). Sometimes exceeds four inches in breadth. Reddish-white with a glossy fawn colour epidermis.

Fig. 2. *Artemis exoleta* (= *Dosinia exoleta*). Cream colour, rayed and variegated with livid red markings. *A. tincta* (= *lupina*) is a much smaller species, ivory white, never rayed, umbones tinged brown or orange.

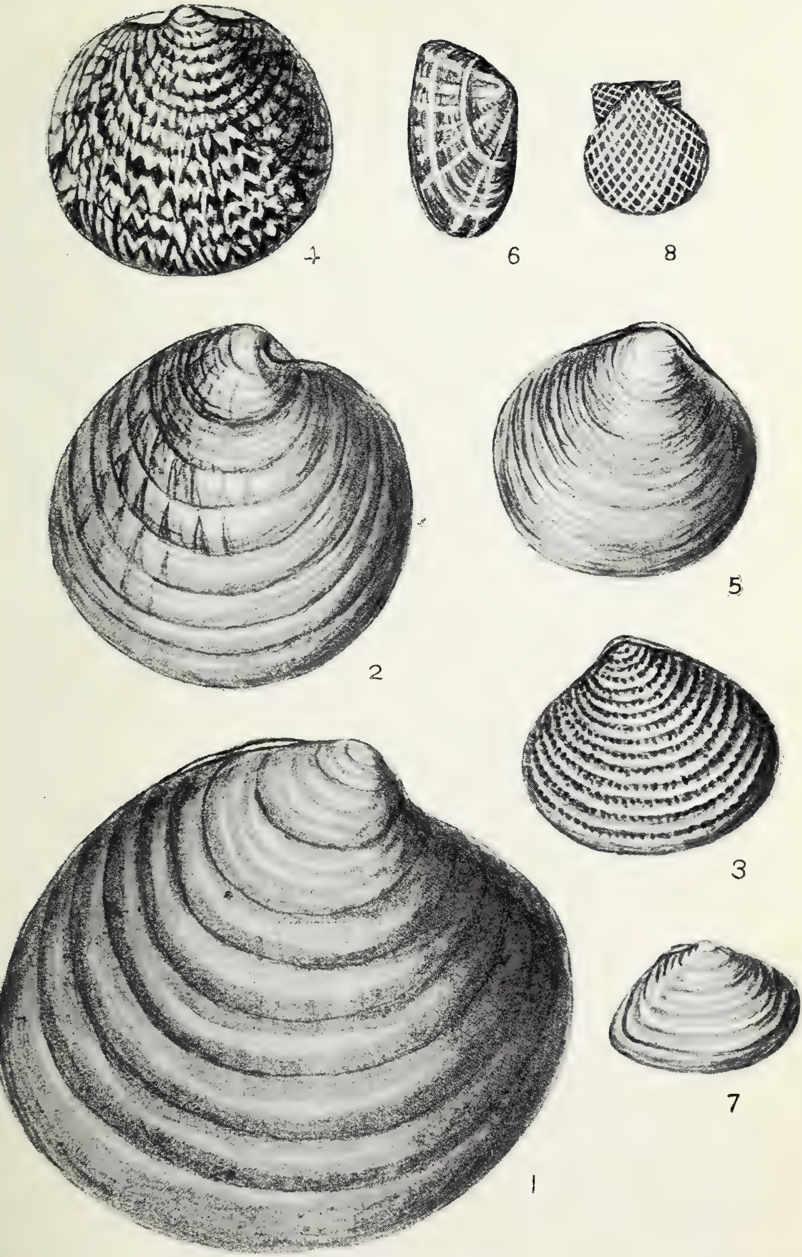
Fig. 3. *Astarte sulcata*. Solid, whitish or rufous, covered with a dull thick yellow or chestnut epidermis.

Fig. 4. *Pectunculus glycimeris* (= *Glycymeris glycymeris*). Whitish or pale red with zigzag markings of dark red arranged radially. Our figure more nearly approaches the variety *pilosus*, in which the zigzag markings tend to a concentric arrangement.

Fig. 5. *Lucinopsis undata*. Opaque, glossy, fawn colour, with fine and irregular concentric striæ.

Fig. 6. *Tellina donacina*. Colour variable, usually yellowish, with interrupted rays of a carnation red hue. *T. crassa* is a larger species, rounded oval, with strong concentric grooves.

Fig. 7. *T. tenuis*. Very thin and glossy. Colour variable, "ranging from pale crimson through orange and yellow to almost white." It is never rayed. *T. fabula* is ovate-oblong, with oblique striæ on the right valve only.



British Sea Shells.

Plate IV., page 156.

Fig. 8. *Pecten striatus.* Very fragile, almost transparent, colouring not unlike that of *tigrinus.* A northern species. *Pecten tigrinus* (= *P. tigrinus*), a larger species, is usually brownish-red, variegated with whitish streaks and patches, never spiny. *P. varius*, a still larger species with spiny valves, and exhibiting extreme variation in colour. Albino examples are rare.

MEMORANDA AS TO THE MOON.

THE Moon, "our nearest neighbour in the heavens," may be observed with especial interest at the seaside. There is usually abundant leisure, the beauty is enhanced by the glittering floor of water, and it will often happen that either at rising or at setting the horizon is free from obstacles. The paramount influence of the moon upon the rise and fall of the sea will also add to the interest with which she is contemplated by the instructed gazer. In the hope of increasing that interest we venture to offer the following memoranda.

The moon, notwithstanding its apparent size, is one of the smallest of the objects visible to us in the heavens.

The diameter of our earth is nearly four times that of the moon.

The moon is only 240,000 miles away from us, but its distance is slowly increasing.

The materials of which the moon is composed are much lighter than those of the earth. It would take more than eighty moons to outweigh the earth, whilst its bulk amounts to one-fiftieth.

The moon receives reflected sunlight from the earth, just as we do from the moon.

It is by the aid of earth-shine that we are, in certain conditions, able to see dimly the whole surface of the moon when only a small portion is illuminated by the sun. This occurs when a new moon is high in the heavens near the time

of sunset, and the appearances are sometimes spoken of as "the new moon with the old moon in its arms."

The moon, like the earth, rotates on its own axis, and also makes a journey round the earth. It accomplishes its rotation (which is very slow) and its revolution (or earth journey) in equal periods of time.

The fact just stated explains why the moon always presents the same side to our view. It follows from the same fact that the moon's days are a lunar month in length, since they are measured, like those of the earth, by its rotation on its axis.

The apparent rising and setting of the moon are, like those of the sun, due to the rotation of the earth.

When the earth comes between the sun and the moon an eclipse of the moon occurs, and when the moon comes between the earth and the sun the sun is eclipsed to us and the earth is eclipsed to the moon.

The sun measures for us our years and the moon our months. In more correct terms, it is the yearly and monthly recurring changes in the relation of the earth to these luminaries which give us these data.

The moon is seen with horns when young, and again when old. When it is young the horns are directed to the east. When they open to the west it is a waning moon. Landscape artists sometimes make mistakes in this matter when dealing with evening and early morning effects. In the latter the horns should be to the west, and in the former to the east. This is easily explained.

During what is known as "the Harvest Moon," the moon, full or nearly so, rises for several nights in succession before or soon after sunset. Thus moonlight follows daylight without the usual interval of darkness, and the labours of the field may be continued into the night. The phenomenon is explained by reference to the relation of the moon's orbit to the eastern horizon during the autumnal equinox. These conditions are repeated, though with less force, during the

following month, when it is known as the "Hunter's Moon." The best Harvest moons occur on or near the 21st of September.

There is no reason to believe that there is any connection between changes of the moon and the earth's weather.

The surface of the moon has been carefully studied and mapped. Some of its craters and mountains can easily be seen with a good opera glass or small hand telescope.

It is certain that there is in the moon no life such as we know life on the earth, for there is neither air nor water.

Professor Sir Robert Ball, to whose excellent chapters on the Moon we have been several times indebted in compiling the above Memoranda, has the following paragraph in connection with the absence of atmosphere on the moon:—

"It seems probable that a building in the moon would remain for century after century just as it was left by the builders. There need be no glass in the windows, for there is no wind and no rain to keep out. There need be no fire-places in the rooms, for fuel cannot burn without air. Dwellers in a city in the moon would find that no dust can rise, no odours be perceived, no sounds be heard."

SEASONAL NOTES.—AUGUST.

So far as England and Northern Europe are concerned, the last shout of the Cuckoo in 1906 has been heard. His penultimate stutterings are over, and we shall hear him no more till April, 1907. Most of the old birds may not improbably have already crossed the Channel. They do not linger in order to guard or guide their young, but as soon as the pleasures of the egg-laying season are well past their instinct prompts them to return to their southern haunts. Practically they come to us for a yearly recurring long honeymoon. Possibly it is some failure in supply of insects as food which determines their departure. Clearly, however, it is no matter of absolute necessity, for the young birds will remain till

September. They have to find their way to a home quite new to them and that wholly without guidance. As autumn approaches they will be warned, probably by lack of food, that something must be done, and having, without misgiving, taken to wing will be astonished and dismayed to find that the land communication between England and France which existed in the days of their far remote ancestors is no longer available. They will gather together in wondering vexation in the copses on our south-eastern shores, especially favouring Folkestone and some miles north and south. For them, however, no Channel-packet waits, and they will long gaze in dismay at the waste of water which confronts them. They will clear these copses to the last caterpillar, and at length taking counsel of despair, and with courage reinforced by the concealment of danger which dark nights afford, they will depart; the strongest first, the younger and weakest later on. Some, enfeebled possibly by too long waiting on short supplies of food, will drop into the sea, and a few others may possibly perish by dashing themselves against a lighthouse or attempting to enter some light-displaying window. The majority, however, will have attained their end, and for them the rest of the journey is easy. It may probably be preluded by a deep though unuttered vow never to subject themselves to like dangers again. They will then fly south by easy stages over the pleasant fields of France, resting when and where they please.

The Tobacco plant is now in flower. Its petunia-like blooms may be seen in most gardens, for it will thrive even in city squares. Gather a flower, and with a pen-knife carefully slit open the long tube of its corolla from bottom to top. A very curious arrangement of its stamens will be observed. Their filaments adhere to the corolla, and at about two-thirds up they all present knees, which projecting inwards meet in the centre and effectually close the tube. Above these "knees" you will observe four or five disappointed little beetles which

have been unable to get at the nectar below. Let your flower, now slit open, lie at rest a few minutes, and you will then find that some at least of these beetles have taken advantage of your opportune help and passed down to the bottom. Clearly it was the impediment just described which hindered them. What object is served by thus preventing intruders? It is perhaps, difficult to say, further than that it protects the honey. It certainly does not either prevent or encourage fecundation, for both stamens and pistil are in the mouth of the corolla and high above the constriction. It may be that the insects, unable to get down the tube to which they have been attracted by the odour of honey, busy themselves at the mouth amongst the anthers, and thus secure the spreading of the pollen upon the adjacent stigma.

The tobacco flower is by no means the only one in which the condition referred to may be found.

In some well-known instances a reverse arrangement occurs, and the insects, after admission to the deeper parts of the flower are there imprisoned. This occurs in the Birthwort (*Aristolochia Clematitis*). The stamens and pistil in it are enclosed in a perianth which is lined with hairs which all point downwards. They thus permit the entrance of an insect, but prevent its escape until the flower withers. In the meantime, and probably by the aid of the imprisoned insect, the pollen has been shed upon the stigma. *Tipula pennicornis*, a "Daddy-long-legs," is the insect thus maltreated.

At this season the attention of the field-observer is arrested by numerous examples of deformed and discoloured leaves. Some leaves, as in the case of the common dock, are much disfigured, large areas being produced involving, perhaps, half the leaf, which look like thin brown paper. In others, winding and not wholly inelegant lines of white, curve about the leaf and leave the intervening portions green. Such may now be seen in the leaves of the honeysuckle, and will soon be still better shown in those of the bramble. In all instances

these serpentine appearances are produced by the caterpillar (larval representative) of some insect. An egg is in the first instance deposited in the leaf. The grub is hatched and proceeds at once to feed upon the leaf substance, carefully avoiding any opening either above or below. As the grub grows the size of its feeding burrow increases, until at length it passes into its state of chrysalis or pupal rest, to emerge subsequently as a perfect insect. Insects of various orders and species spend part of their lives in this manner. To them the not wholly appropriate name of leaf-miners is given. They are miners only in the military sense of the word; it would be more suitable to call them burrowers. If a word could be constructed which would imply that they burrow not only for the purpose of lodgment but in order to eat, it would be acceptable.

Oak leaves mined by the larvæ of *Lithocolletis*, a genus of minute and beautiful moths, may be observed in abundance in August. The upper surface of a mined leaf appears as if puckered in places. On its under surface the cuticle will be found to have been loosened by the miner and then drawn together, making it look as if plaited lengthwise. The larva is whitish, with a green line along its back. It will remain in the pupal state till next May. In winter, withered leaves containing living pupæ may be found under the trees. There are two broods, the summer one emerges in July.

The little leafless parasitic Convolvulus known as Dodder (*Cuscuta*) is now in full beauty. Professor Lindley, who amidst a wealth of accurate description often introduces a quaint expression, calls Dodder "an odd little plant." There is, surely, nothing about it suggestive of oddity, except its unfortunate name. All its tribe are graceful, and none more so than itself. The slender climbing and twisting stems, half translucent, and of a rosy-pink tint, with the clusters of delicate white flowers which they support, are singularly beautiful. Nor, when it covers patches of clover many yards in width,

can it be considered as very little. It is an annual, and grows from seeds which have fallen into the earth. Having implanted itself on the stem of its unconscious host—heath, thyme, gorse, clover or other plant—it allows its earth-roots to die, and henceforth lives suspended in the air. Lindley says that "it feeds only upon dews and rain," but there can be no doubt that it robs its host of sap. It is a true parasite, not, like ivy, simply a climber.[1]

Hazel nuts are now of full size, and their shells are hard. They are wholly filled, however, with "pith." This pith is a firm but succulent structure, which in its present state might be taken, when cut across, for the nut or kernel itself, excepting that it does not glisten and is not crisp. It wholly fills the shell and adheres to it. The germ or kernel of the nut must be looked for with care or it will be missed.[2] It is not bigger than a pin's head, and is hung in the apex of the pith, just under the pointed end of the shell, and in contiguity, of course, with what remains of the stigma. This minute germ will display a wonderful power of development. Attracting nutriment to itself through its umbilical cord it will eat up and transform the whole of the pith and literally take its place. Much to the same end—though with widely differing detail—the germinal spot in a hen's egg develops and eats up the yolk and white, and the organised chick comes to fill the egg-shell. Note that in neither case is any provision made for expansion of the shell itself, which is fully formed from almost the first.

The student should gather a nut once a week, and cut it across and observe the growth of the kernel (or seed) and the disappearance of the white nutritive pith.

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[1] There are three British species of Dodder, but excepting in size their differences are not great.

We have always plenty of the lesser Dodder on the Haslemere hills, and shall be pleased to supply specimens.

[2] These notes were written on July 26.

Acorns are at present date in a very different stage from that of the hazel nuts. They are very small and do not look very hopeful. The acorn is almost concealed in its cup, but the latter is as yet but a poor affair. Both must grow together.

Yew berries show important differences from both Hazel-nut and Acorn. The true seed, naked, is of full size and fairly hard, but it is green, and it is not, as yet, encapsuled in the beautiful cup of thick red waxy-looking flesh which will constitute its conspicuous feature in autumn. Its cup has yet to grow forwards and embed the seed. It will be a new growth from the part immediately beneath the seed, and not, as in the other instances, a development from previously existing bracts. Its growth will be well worth watching.

BEST BOOKS ON SEASIDE NATURAL HISTORY.

Although to many of our readers the priced list of valuable books on Seaside Natural History which we published last month proved, we are assured, very acceptable; to others it was somewhat tantalising; some of the most tempting works were to them inaccessible on account of cost, and others because only obtainable second-hand. It is suggested that we should attempt to give more definite guidance, and such as can be more easily made use of. We gladly accept the task, and proceed to do our best to specify the best books on Seaside topics which are now in print and not costly.

As a general guide to "Life by the Seashore," there is none better than Miss Marion Newbigin's work published under that title by Swan Sonnenschein, and price only 5s. 6d. It is thoroughly up-to-date in its Natural History, is well illustrated, and well written. It deals, however, with animal life only, and omits seaweeds, sea plants, sea birds, and all references to geology.

Dr. Harvey's "Seaside Book" is charmingly written, and is, for a beginner, more attractive than Miss Newbigin's, but it cannot be considered up to date.

On the crab and shrimp family there is none better than Mr. Stebbing's "History of Crustacea." It is profusely illustrated. It is one of Kegan Paul and Co.'s "International Scientific Series," and costs only 5s.

As an illustrated guide to Marine Botany there is perhaps none better than Gray's "British Seaweeds." Gifford's "Marine Botanist" may also be mentioned.

On shells, "Sowerby's British Conchology."

Mrs. Lane Clarke's "Common Seaweeds," although very small (price only a shilling, Warne and Co.), may be found sufficient, and is good as far as it goes.

On Edible British Molluscs, Mr. Lovell's book gives full information, not only as to natural history, but methods of cooking. It has beautiful coloured illustrations.

For all that concerns the Moon and observations of the Heavens in seaside evening walks Sir Robert Ball's "Story of the Heavens" stands unrivalled as the best book. Published by Messrs. Cassell at 31s. 6d. From the same firm may be obtained the same author's "Starland, or Talks with Young People about the Wonders of the Heavens"; a very excellent and well-illustrated book, published at 6s.

A series of very excellent little books on Natural History Rambles has been published by the S.P.C.K., at the modest price of half-a-crown. It includes Professor P. Martin Duncan's "The Sea-shore, its Animals and Plants," in which "scientific terms and names have been omitted as much as is possible; and the contents of the book have been made to refer especially to the inhabitants of the shore, or to that part of the sea-coast which is between and near high and low tide-marks." It includes chapters on the sea-shore in general, its geological changes, &c., Plants; Microscopic Plants and Animals; Jelly-fish, Sea-mats; Shore-worms; Star-fishes; Crabs; Shell-fish, &c.

The S.P.C.K. are also the publishers of Dr. M. C. Cooke's well-known book, "Toilers in the Sea," containing well-written chapters on "Sponge weavers, Sea-fan makers, Coral builders, Tube-masons," &c.

Mr. Charles Dixon's "British Sea Birds" was published in 1896 at half-a-guinea.

A very good bibliography of popular works relating to the British Fauna is given in F. G. Aflalo's admirable sketch of the Natural History (Vertebrates) of the British Islands; published by Messrs. Blackwood in 1898.

Those wishing for a very brief and readable summary of life in the seas cannot do better than purchase Dr. Sydney Hickson's "Story of Life in the Seas," published in Macmillan's shilling "Story" series.

NOTES ON SEA BATHING, &c.

With but few exceptions it is only the naked-skinned animals that go much into water. The hippopotamus, the elephant, all pigs, and the tapir love to bathe in warm weather. However hot it may be, sheep, oxen, horses, and all animals having fur seldom or never think of going into water. Many of them enjoy cooling their feet, but they shun all wetting of their coats. Possibly none of the monkey tribe, not even the anthropoid apes, systematically bathe or even wash. The polar bear and the sea otter afford, perhaps, the best examples, and very exceptional ones, of animals still keeping a good coat of hair which habitually frequent the water. Whales, seals, the dugong, and the manatee are most of them almost wholly hairless. Seals are the chief exception, and only some of them.

We will not venture to base any inferences on these facts. It may easily be the case that too constant immersion, as in the whales and sirenians, is a cause of the falling of the hair.

In all countries, excepting the coldest, some portions of the human race show a fondness for water. Place of resi-

dence has much to do with the development of this fondness, and access to the sea or to salt-water is a most powerful attraction.

Several different circumstances combine to afford explanation of the well-known fact that it is far more invigorating to bathe in the sea than in fresh-water. In ponds, lakes, and shallow rivers the water is much influenced by the sun, and in summer it is often almost tepid. Boys will bathe several times in the day, or remain in, as Wordsworth has recorded of his own boyhood, half the afternoon. Such bathing, however pleasant, is probably the reverse of health-giving. The sea, on the other hand, is always cold enough—at any rate, in the English climate—to give a little shock, to be followed, under favouring conditions, by healthy reaction. Its temperature changes but little with season, and unless the shore be very extensive and flat, the summer's sun does not very definitely warm it. Although this fact entails the greater need for the exercise of judgment and self-control as to staying in, it is the main secret of its beneficial effects. In addition there is the presence of salt, which acts as a slight irritant and stimulates the circulation in the skin; and we must also mention the dash of the waves and the alternate immersion and exposure of the upper part of the body, thus occasioning a succession of little shocks. But the temperature is the main thing, as any one may convince himself who has access for bathing to really cold spring water. The latter, although without salt, will refresh him almost as much as the sea.

From the statement of the fact that it is the shock of the cold which is chiefly beneficial, there follows obviously the rule that it must not be too prolonged. Bathing for pleasure is one thing, for health quite another. So far as health is concerned the bathe can scarcely be too soon over. Much harm is done by staying too long in. It is, we repeat, the shock of the cold which does good, and if the immersion is continued until chilliness is felt there is risk of internal congestions and many forms of mischief.

Never bathe if you feel chilly and disinclined. If you are heated never wait to cool, but get in as soon as you can.

Many persons will allege a feeble circulation as a reason for not bathing. So it is, if the bath is to be protracted. Judiciously managed, however, cold bathing is a sort of gymnastics for the forces of the circulation. Let the first few bathes be dips only and taken on hot days, and if need be, after exercise. Most persons will find that with care in these respects the ability to secure good reaction afterwards rapidly increases and the circulation is correspondingly strengthened.

Never bathe directly after a full meal, but there is no harm in doing so if the meal has been a light one. Those who are weakly will do well to take a biscuit and glass of milk as a preparation for a bathe.

After bathing, dress as quickly as possible and take exercise. When quite warm a meal should follow, but never go into the house to sit down until reaction is well established.

For those whom it seems to suit there is no objection whatever to bathing every day.

The tonic effect of sea air and bathing is to many persons productive of inconvenience during the first few days. The beneficial effects of the first week of the holiday are often lost for want of due attention to a precaution which our grandmothers were always careful to insist upon. The dose should be taken before the first bathe.

In connection with seaside recreations, and especially with boating and bathing, it is not wise wholly to forget the possible occurrence of Accidents.

In the case of a person rescued from the water in an apparently drowned condition, the following measures should be promptly taken. If the body be that of a child, it may be held up for a few seconds (but not longer) by the legs to allow the water to run out from the mouth and throat.

This should not be attempted with an adult. In either the body should be placed, as quickly as possible, face downwards on a thick cushion formed by the coats, &c., of the bystanders. This cushion should be under the chest only and the head should hang down over its edge, the mouth being kept open by means of any suitable bit of wood which may be at hand. Unless, however, there be a spare pair of hands for this latter object, it may be neglected. *The main thing is to proceed at once with artificial respiration.* To effect this, the operator should kneel astride the trunk and with outspread hands placed one on each side of the back, make firm but gentle pressure, forcing the chest downwards on the cushion. In the course of about three seconds all pressure should be removed and the chest allowed to fill by its own elasticity. After another three seconds the pressure should be repeated, and so on, thus effecting ten artificial inspirations in the minute. It will be a satisfactory proof of efficiency if some little gurgling in the throat occurs at each repetition. However discouraging the condition may seem the attempts at resuscitation should not be abandoned for a full hour, nor should they on any account be interrupted by any slight evidences of recovery, for these are often illusory.

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CORRESPONDENCE.

DATE OF THE EXODUS.—An esteemed correspondent calls our attention to the fact that the date of the Exodus is given in "*The Centuries*" as two centuries later than in other chronologies, and asks for authorities. Our dates, as given in *The Centuries*, are based upon Flinders Petrie's statements as being those of the most recent authority. He points out that the duration of the period of the Judges was probably much over-estimated, and that it ought to be shortened by two centuries. It was by calculating backwards that the supposed date of Moses was reached, which was thus much antedated. In Egyptian history proper no data exist. All authorities agree that the Exodus must be placed in the reign of Merenptah, and the reign of this king is assigned by Petrie to the twelfth century, B.C. See his History of Egypt," p. 251. We have therefore, we believe, the best authority for giving the name of MOSES to the twelfth century B.C. as is done in our "CENTURIES."

JUVENIS asks whether the cuckoo-spit is caused by an Aphis. The insect which causes the "Cuckoo-spits" is not a true Aphis. They are the home of the larva of the frog-hopper, a greenish insect allied to the Aphis, but in which the hinder legs are lengthened and enable it to jump. *Aphrophora spumaria* is the scientific name of the species commonest in England, but there is a smaller one *bifasciata*, which is also very common.

The larva is developed in the midst of the mass of froth which it has formed. It is a naked greenish or yellow grub, which in its later stages developes six legs, compound eyes and two pairs of short wings. Living in a warm bath of bubbles which protects them from heat, cold and wind, these naked insects may be supposed to enjoy luxurious life. Their environment is an object of disgust to all enemies.

We shall write more at length on these interesting insects in a future number.

CHRONOLOGIST.—We agree with you that we certainly ought to give up the most confusing practice of counting time backwards in the B.C. periods and forwards in the Christian ones. Julius Cæsar was born in the year known as 100 B.C., and his age, therefore, runs with that century. He was 56 when he was assassinated. Now, if we might speak of this as the fifty-sixth year of the first B.C. century,

all would be clear. If, however, according to present custom we are to call it the forty-fourth, a subtraction sum is needed in order to ascertain his age. Similar inconveniences apply to all B.C. dates.

MONŒCIOUS, DIŒCIOUS, AND POLYGAMOUS.—"PUZZLED" directs our attention to the description given in "Babington's Manual" of the flowers of the common Maple. They are described, he says, as being "polygamous" and although all are said to have stamens and pistil, male flowers are mentioned in which "the stamens are longer than the others." "Puzzled" is by no means the first to whom the several terms used in botanical descriptions which have reference to what is termed the marriage of flowers have proved perplexing. Monœcious and diœcious are two of them and polygamous makes a third.

We will try to make them plain. The *raison d'etre* of a flower is the formation of seed. If a flower is called "perfect" it contains in itself a seed-vessel from which passes a style with its stigma and stamens which surround the pistil and are destined to produce pollen, which, falling on the stigma, will lead to the formation of seed. Unless the pollen falls on the stigma and passes down the style into the seed-vessel what is called fecundation will not take place, and the otherwise possible seed will perish and its containing capsule will shrivel.

se two structures, seed-vessel and stamen, are the essentials of a perfect flower. In order to protect them from wind and weather, and also for other purposes, certain wrappages are produced which cover them in, and to these are given the names of calyx and corolla. or floral envelopes. These are exceedingly useful, but not essential.

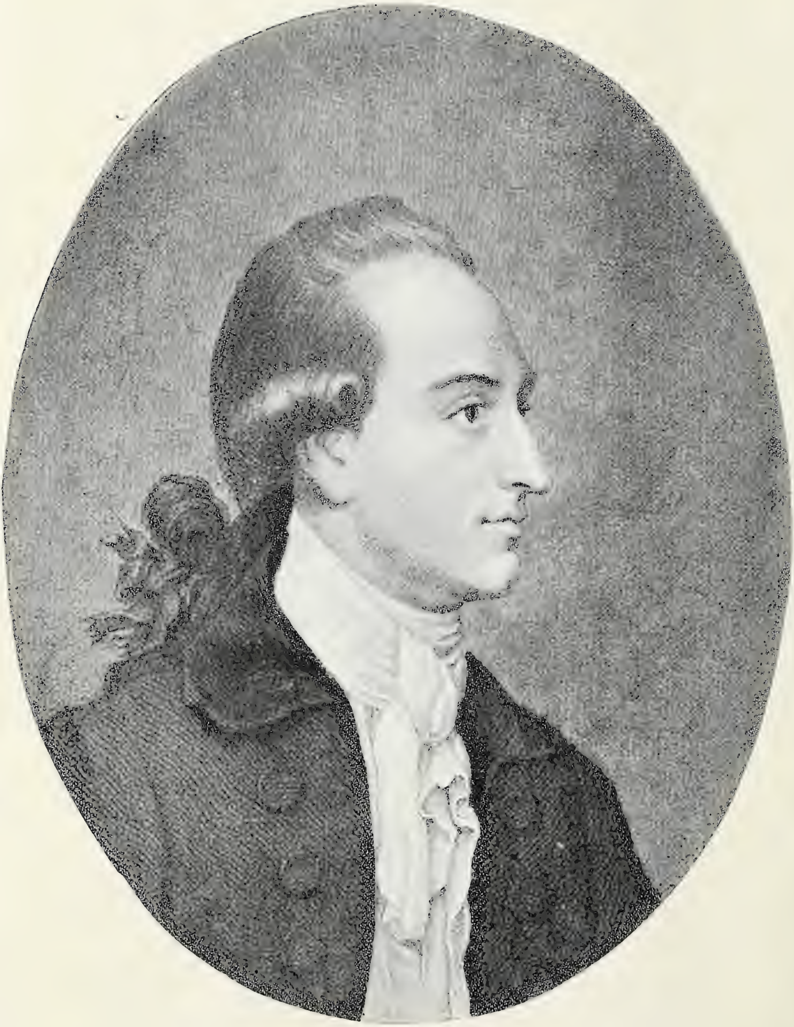
The next point which we have to make clear is that not all flowers possess the two essentials together. If a flower has stamens but no pistil and no seed-vessel, it is said to be a male flower and to be staminiferous. If it possess a pistil with its stigma above and seed-vessel below, but no stamens, it is said to be a female flower, or pistilliferous. These divided or half-complete flowers are dependent upon wind or insects, &c., for the conveyance of the pollen from one to the other, for this conveyance is absolutely necessary for the production of seed.

Now it is possible that these imperfect flowers of each sex may be found together on the same plant, or, on the other hand, that they may occur, with mutual exclusion, on different plants. If a plant produce both it is said to be monœcious, but if only one it is diœcious. These unfortunate terms do not explain themselves, and many who find no difficulty in realising the facts, yet find it hard to remember which is which. Diœcious means that the two differently sexed flowers have different homes (or, literally, houses), and monœcious that they are content to dwell together on the same plant, or, etymologically, in "one house."

We have not, however, exhausted the combinations which are possible. It may be that a monœcious plant having both male and female flowers separately may also have some perfect ones. This condition of triple variety is realised in the maple, and hence the expressions in Babington which have puzzled our young correspondent. Such a plant is described very awkwardly as "polygamous."

CLASSIFICATION.—It has been well said that "classification is the superstructure and outcome of morphology." The best classification is simply the best exposition of the sum of our knowledge of the things classified.

PREHISTORIC MAN.—Professor Ray Lankester, in his recently published Lectures, gives the following estimates: "The most important of the prehistoric remains of man take us back, to judge from the position in which they are found, some one hundred and fifty thousand years (150,000). These are the remains found in river gravels in England and France and other countries, proving that man lived here in a savage state with the Mammoth, the Rhinoceros, Hyena, Cave Lion and Cave Bear" (p. 85). After dealing with the facts as to the thickness of stratified rocks, he proceeds: "The estimate thus given probably does not fully represent the time which has elapsed. If you take 1,000 years for each foot you only get an approximate measure of the time represented, because a great deal more time has passed than is actually shown by the permanent deposits or strata. Strata have been broken up by the sea and water and have been deposited again and again, and it is probable that a much longer time has elapsed than one thousand years for each foot of the deposits which form the stratified crust of the earth."



THE

MUSEUM GAZETTE.

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EDITORIAL NOTES.

The Board of Education has just received the Report of its Consultative Committee upon Higher Elementary Schools. This report is ably analysed in the *Times* for August 21, and is well worthy of attention. To ourselves it is a matter of great regret that the Committee has taken no cognisance of Museum Education. From a Committee on which Miss Manley, Mrs. Bryant, Sir Michael Foster, Mr. Hobhouse and Dr. Norman Moore sat, better things might have been expected. The time has surely arrived when the superiority of the objective teaching afforded by well-arranged Museums over merely verbal instruction ought to be well recognised. Instead of that, we are still told that everything must depend upon the skill of the schoolmaster, who is thus left to make his bricks without a supply of proper straw.

"The Committee recognise that the successful attainment of the aim in view will be due far more to the teacher and the character of the teaching than to the subjects taught."

This somewhat helpless dependence on heaven-sent teachers is not hopeful. Let the Education Board see to it that those whom they employ are well provided with the means of teaching. We are commenting on the *Times* summary alone. It may be that in the Report itself, which we have not yet seen, there are some eloquent passages in advocacy of objective teaching as carried out in Museums. We hope there are.

In the summary to which we refer above there occurs the following:—

"The Committee discuss the question of what are the qualities which employers and other persons qualified to express an opinion consider it most worth while to aim at. . . . 'Apart from the moral qualities, which come first in a general sense,' the thing needed is not only knowledge but a right attitude of mind, a mind confident in its own power to observe and think and in the habit of observing and thinking—a mind in which interest makes for intelligence and intelligence for interest.

"The first necessity is to secure for each child as much 'humanity, as much accurate knowledge of general elementary fact and as much mental power and mental aptitude as can be expected,' &c., &c.

"The Committee lay stress on the necessity of not losing sight of the truer utility of the course effected by a general stimulation and training of the faculties."

These paragraphs ably express all-important truths. Their truth and their importance are, however, alike obvious, and what the public may desire from the labours of such a Committee is rather the practical measures by which they may best be realised. To ourselves one reform of foremost value is clearly indicated. It is that the old methods of verbal teaching should be replaced to a very large extent by that which Museums offer. What more likely to enable the mind to feel "confidence in its own power to observe and think" than that it should have been already well exercised on visible and tangible things? Where, if not in the galleries of a well-explained Museum, shall we find that interest makes for intelligence, and intelligence for interest? Where can the accurate knowledge of general elementary fact be so rapidly obtained; and finally, where can the general stimulation and training of the faculties be so well effected?

In pleading for the provision of well-equipped Museums as essential parts of all schools, we feel to be speaking as much in the interests of the teachers as of the pupils. They would tend, as soon as their employment should be well understood, to vastly facilitate the labours of the schoolmaster. They would become places in which pleasurable instruction would be given mutually by the pupils themselves.

Even as to all-important moral teaching, a Museum which includes portraits and biographical schedules may fairly claim to take a share. Moral teaching is surely based more truly on example than on precept, and whatever expedients may tend to ensure familiarity with the lives and the thoughts of good men, must tend to exalt the moral sense and enlighten the conscience. No one can foresee what triumphs may be in store for the insistent secularist, but it is inconceivable that any Parish Council will ever forbid its schoolmasters to give prominence to the lives of such men as Alfred, St. Louis, Howard, Fénelon, Wesley and Woolman.

Very similar remarks apply to another Report recently issued by the same body on the adaptation of the teaching in Rural Schools to the wants of those concerned. This Report states that

"careful selection of matter and methods of instruction, and active sympathy on the part of the people of influence are alike necessary to overcome the apathy of young men and women towards continuing the education they have received in the elementary day school."

We may be allowed to urge that the education proposed should be made in itself attractive, and that to this end nothing would be more efficient than large and well-arranged Museums. From these the teachers would draw their materials and in them they would give their lectures. After enumerating the various subjects to be taught, it is suggested that, although so various, they are all really associated—

"The course is really one subject and might find its text in a single reading book."

Let it find its text rather in a Museum, or at any rate let the Museum be preliminary to the text-book. It is this unending substitution of the reading-book and the class-room for opportunities for obtaining familiarity with the things themselves which induces the apathy which all so much regret.

As was stated in our outset, we understand the word Museum in a wide sense. It is intended to comprise much more than

a collection of stuffed birds and fossils. Our pages have, it is true, been hitherto largely occupied with natural history and natural phenomena. We claim, however, that History and Biography are well within our scope, and as we close our special Seaside topics with the present number, it is designed to devote in future more space to humanity. Portraits, anecdotes and space-for-time schedules will receive chief attention, leaving to the many excellent works now easily accessible all the more systematic treatment of the subjects which we shall endeavour to illustrate.

Our pages are designed especially to assist those who are engaged in teaching others. They are intentionally suggestive rather than exhaustive, and our ambition will be satisfied if we succeed sometimes in placing difficult matters in a clearer light and in pointing the way to original observation.

It is to be regretted that the study of Botany has been too much restricted to the examination and naming of flowers. It would be most unjust to many excellent teachers to suggest that the study of plant-life in its general laws and very varied activities has been neglected. Yet it remains true that in the popular teaching of the subject such has been too much the case. Our Gazette will endeavour to divert attention to these topics. Familiarity with individual plants, and their names, may be gained in the vivarium and the field-ramble. It should be the part of the commentator to expound so far as he is able the less openly exposed pages in Nature's book. In a former number we have tried to illustrate and explain the very curious phenomena which attend the flowering of the lupin in our London squares, and amongst other similar subjects we have in our present issue something to say about the growth of the Yew-berry, the Bluebell, and the withering of the seed-vessels of the pea tribe.

Our *Portrait Gallery* to which our Frontispiece belongs is referred to at page 226.

ON FISH AS FOOD.

Speaking in general terms, there can be no hesitation in saying that most sea-fish afford nutritious, easily digestible, and thoroughly wholesome food. It matters little to assert that fish contains less nutriment than beefsteak. This only concerns the housewife in making her purchases. If the chemists have convinced her that it takes a pound and a half of cod to equal a pound of steak, and if the cost of the two is the same, let her choose the steak. At table all that it is needful to remember is, that if you had intended to eat half a pound of steak, you must take rather more of cod to obtain its equivalent. The most concentrated foods are, however, by no means always the most suitable.

Of all fish the herring is the one most to be commended. It is good in all forms, fresh, lightly salted, or kippered, and it disagrees with no one. It is said that Amsterdam was built on herring bones, and the Dutch at the time of its building were an energetic, vigorous, and intellectual race.

Between the "fat fish" and the "dry fish" the herring stands midway. It is not like eels and salmon, too fat, nor like haddock, cod, and whiting, too dry and insipid.

Although chemistry gives no support to the popular creed that fish more than other foods supplies phosphorus to the brain, yet it has been the testimony of not a few brain-workers that a fish diet seemed to suit them. This may be because fresh fish, properly cooked and taken in moderation, is digested more quickly than meat. Such fish is said not to require three hours for complete digestion, whilst beef requires nearly four. If, however, fish is over-boiled, it becomes stringy and hard, and is difficult and slow of digestion. Salted fish is also slower of digestion, but nowise unwholesome.

It is, we believe, a general observation that those who keep

Lent with strictness lose flesh, that is, fat, somewhat, and many complain of being weakened. Of all forms of animal food, white, dry fish, such as cod, haddock, and whiting, is probably the least fattening. In our ordinary mode of life, however, things are so complicated that it is difficult or impossible to trace the influence of any one article of food. An Englishman usually eats his fish in addition to flesh, and only in very moderate quantities. At the seaside he may not improbably get it less frequently than at home if his home be a city, whilst in many country districts he can scarcely get it at all. He will run no risk of debility if he takes it as often as it is offered, and in any quantity that meets his appetite.

It is matter of notoriety that the dwellers in fishing villages generally appear to enjoy robust health. Other agencies apart from their liberal fish meals may, however, contribute to this result. It is thought that they are less liable to tuberculosis and scrofula than those who live inland, but here, again, it may be that eating less flesh meat, and perhaps drinking less milk, they are less often exposed to the risk of swallowing the bacillus. The strong and vigorous are those who alone can engage in a fisherman's life, and thus the population undergoes a process of social elimination which tends to the transmission of sound constitutions.

As regards the risk of leprosy, it is to be clearly recognised that not the slightest imputation rests upon either sound fresh fish or well-cured fish. All that is allowed to come into the English market may be eaten in any quantity without any danger whatever. It is the communities in which decomposing fish is habitually eaten which suffer from this terrible malady.

To many persons the fat of fish, of eels, salmon, &c., is absolutely indigestible, and may cause symptoms of liver derangement, &c., lasting several days after the meal. Here materfamilias and the chemists are not quite in accord, for Popoff, as the result of experiment, arrived at the result that

fat fish is more easily digested than lean. If by lean fish is meant stringy cod, it may be a fact; but if it is meant to contrast salmon and eels with sole and whiting, the statement approaches absurdity. Even with salmon there is, however, much difference as to the precise part from which the slice is taken. Many stomachs which can deal with lean flesh from the back of the fish would encounter certain disturbance if helped to the thin and fat portions. It is the latter which are the delight of the gourmet.

Neither cod, haddock, whiting, red mullet, nor mackerel are in season in August. The season for salmon and trout ends with the month. Herrings, plaice, smelt, turbot, soles, grey mullet, hake, flounder, and brill are in full season in September.

Cockles and periwinkles are quite safe food if taken from clean waters. They disagree with no one. Respecting the despised periwinkle, the naturalist Buckland, who was also a judge of foods, bears, incidentally, a genial testimony. He was invited to an American dinner, and ate, for the first time, Transatlantic oysters, of which he records that they had a different taste to the English, and were somewhat like "a very good periwinkle."

Those who can eat the Crustaceans, crab, lobster, &c., with impunity may be congratulated, and at the same time advised to indulge with caution. They may also be informed that, as is the case with the poisonous forms of mushrooms, the addition of vinegar tends definitely to diminish the risks.

If you can get oysters in good condition and with clean shells, whether English or American, eat them thankfully, but be very careful to remove every portion of their beards. A little vinegar not only improves them, but probably makes them safer and more wholesome.

It has been calculated that it takes fourteen oysters to equal the nourishment contained in a single egg, and two hundred and twenty-three to equal a pound of lean beef. Thus the chemists are, for once, at one with paterfamilias in not regarding oysters as an economical form of food.

Dr. Robert Hutchison, from whose excellent work on Food we take the above statement, adds that oysters are "an extravagant form of food, for a given quantity of proteid costs about three times as much in the form of oysters as it does if purchased as beef." Despite the extravagance, we should be glad to know the shop where two hundred and twenty-three oysters can be had for the price of three pounds of beef.

A SEASIDE MUSEUM.

A CORNER of the Haslemere Museum has been set apart for many years for the display of a series of objects illustrating the common plants and animals of the seashore. It is designed to afford opportunity for study to those going to or returning from a holiday on the coast. It has proved very useful, though limitations of space have precluded much attempt at detailed arrangement. We append an annotated list of some of the objects which it contains and which any Seaside Museum should endeavour to collect.

I. BIRDS.—The Stone Curlew, or "Norfolk Plover," as it is sometimes called, the Ringed Plover, or "Sand Lark," the Kentish Plover, Oyster-catcher, and Little Stint amongst the Waders; a group of birds frequenting our foreshores. They have slender feet and bill, they make no nest, but deposit their eggs in a hollow amongst the shingle. The eggs and young so closely resemble their surroundings that detection is very difficult.

The Cormorant, Shag and Gannet. These may be considered as the British representatives of the Pelican. The diving and fishing operations of these birds always afford pleasure to visitors to their haunts. The former is frequent in the south, the two latter are more abundant on the rocky northern coasts. Of common gulls we may mention the Herring Gull and the Black-headed Gull, and no series could

be considered representative if the Guillemot, Razor-bill, and Puffin, or "Sea-Parrot," were omitted. The above, with others mentioned by Mr. Dixon, are represented in our collection by coloured illustrations, if not by actual specimens. There is also a collection of Sea-birds' eggs, in which those of the Guillemot constitute a very ornamental feature.

Illustrations of our seaside birds, suitable for grouping in swing frames, may be found in Messrs. Cassell's "Familiar Wild Birds."

II. Fish.—The Fifteen-spined Stickleback which frequents all our coasts. Its remarkable nest may sometimes be found in rocky pools between tide-marks. "The fish is about six inches in length, and it is long and very slender at the tail, and the tail fins are very large. The head puts one in mind of that of a small pike, and there is a row of fifteen small spines on the back, and each with a little piece of membrane on it, in front of the fin. The nostrils are midway between the snout and the eyes. The colour varies: in some it is reddish-brown on the back, and this is the colour of the first rays of the dorsal fins and tail. In others it is a deep green. The cheeks and sides are often golden-yellow, and lighter on the belly. It changes its colour quickly under the influence of terror." Mr. Couch writes of its nest: "The fish either find growing, or, certainly in some instances, collect together, some of the softer threads of green or red seaweeds, and join them with so much of the coralline growing on the rock as will serve the purpose of affording firmness to the structure. They constitute a mass, five or six inches long, of a pear-like shape, and almost as stout as a man's fist. A thread is employed with much skill and patience in winding these materials together, and there is no doubt that its substance is derived from the creature's own body. It much resembles silk, and is elastic, and appears to consist of smooth threads glued together."

The Three-bearded Rockling is also a nest-maker, using the common coralline for this purpose, and laboriously

collecting it within an area of more than 200 feet. This "ugly fish"[1] is often found underneath seaweeds or on muddy shores, hidden by a stone. It is long for its breadth and height, has a flat head, prominent eyes, and there are two feelers or barbs on the upper jaw, and one on the lower. It is about a foot or fourteen inches in length, and the colour is rather uniform, the back and sides being chestnut-brown. But the fish is often found in deeper water, and then it is of a brighter and yellow-red tint with spots."

Many species of the Goby tribe, the commonest being the Rock Goby, or Miller's Thumb, about six inches long, grey-brown with black spots. It frequents high rock-pools communicating with the sea only in very high tides and stormy weather.

The curious Pipe-Fishes or Sea-Adders, and the equally remarkable Sea-Horses. Excepting the Worm Pipe-Fish, the majority of these do not live near the shore.

The purse-like capsules (often erroneously spoken of as "eggs") are receptacles for the eggs of various species of sharks and rays. The purses of the sharks are deposited in autumn, those of the skates in early summer. The more familiar are those of the Spotted Dogfish or "Nurse" (*Scyllium catulus*), the Lesser Spotted Dogfish or "Row-hound" (*Scyllium canicula*), the Common Skate (*Raia batis*), Thornback or "Maid" (*Raia clavata*).

Fish, as a rule, are not very suitable objects for preservation and are best studied on the fishmonger's slab or at the sea-side market. In such a Museum as is here contemplated coloured plates must for the most part suffice. A good series may be obtained from the "Royal Natural History."

III. Flowering Plants.—Our collection displays dried specimens, also coloured illustrations of phanerogams taken from the first edition of "Sowerby's Botany." The latter are arranged in swing frames, and include all the species

[1] "The Seashore," p. 251.

mentioned in our July issue, together with many others less widely distributed. Occasionally, through the kindness of friends, we are enabled to exhibit fresh specimens in the Vivarium.

SEAWEEDS.—Seaweeds are vegetables of the very simplest organisation. They have no sap-tubes, and are nourished by direct imbibition. If part of a dried seaweed is put into water, that part only will swell up; the rest will remain dry. Seaweeds bear no flowers, but there are formed in the substance of the plant, in great abundance, spores which serve as seeds. These spores possess an extraordinary power of swimming like animalcules; they plant themselves extensively and grow readily. Seaweeds have "roots" only for fixation purposes. Most of them are annuals. Seaweeds must be carefully distinguished from corallines, gorgonias (sea-fans) and sponges, all of which belong to the animal kingdom.

Pressed specimens of the Bladder-wrack, Saw-leaved Fucus, the Cordweed (*Corda filum*), the terror of the sea-bather, the Sea-oak (Halidrys), and many other common algæ.

Dried specimens of Seaweeds may be very effectively exhibited under glass in frames. Coloured illustrations of them suitable for framing have been repeatedly published. By far the best, but at the same time the most expensive, are those by Turner. A framed set of Turner's plates would equip and ornament any Seaside Museum.

IV. SPONGES.—The common Crumb-of-bread Sponge (*Halichondria panicea*) which forms the well-known yellowish or greenish crusts on rocks and the stems of seaweeds. The equally common Ciliated Sycon (*Sycon ciliatum*), which forms little oval white sacs about two inches high on rocks.

Oyster shells extensively bored by Cliona, a burrowing sponge. This sponge also bores into limestone rocks. Much damage has been done by it on the Dalmatian shore. It would appear that the manner in which the boring is effected is not properly understood. Some writers hold that the carbon dioxide which the animal gives off destroys the shell.

Others think that the sponge bores by grinding its spicules against the softer limestone; finally, it is supposed that the power of contractibility of this sponge is no mean aid in the work of excavation. Choanites, fossil sponges in chalk flints. They frequently occur in the semi-transparent "brooch pebbles" amidst the shingle at Brighton, Bognor and Worthing.

V. Shells.—In addition to the common shells of the sea-shore, described and figured in our pages, our marine department contains egg-cases or capsules of carnivorous mollusca. These are tough and leathery, and of varied shapes, and each contains many eggs. The best known are those of the whelk (*Buccinum undatum*), sometimes in bunches as large as one's fist; the dog-whelk (*Purpura lapillus*), the capsules of this species "are like delicate pink grains of rice, set on tiny stalks. They are not attached to one another, but are set closely together in groups in sheltered nooks of the rocks. A single Whelk has been observed to produce 245 capsules!"

Boring shells and examples of their work, including: (*a*) A mass of hard rock extensively bored by the Piddock or "Paper shell" (*Pholas*). The shells may be seen at the bottom of some of the holes, and are projecting from others. (*b*) A piece of wood bored by the "Ship-worm" (*Teredo*). The burrow is lined with a thin shell of white paper. The "Ship-worm" is not a worm, but a true mollusc, with a bivalve shell, which, however, is so small that it was long mistaken for its jaws. Its body is almost wholly outside the shell. It does not bore stone, but only wood, and is very destructive to piers, &c.

Mussel shells with the byssus attached. The byssus consists of silky threads used by the animal to anchor its shell. The manner in which these threads are made may be readily observed in an aquarium. The tongue secretes a fluid, which is poured into a groove or canal, forming a deep longitudinal furrow extending the length of the tongue; in the canal it dries into a solid thread. "The workmanship of land and

sea animals, in forming the same production, is very different. Spiders, caterpillars, &c., form threads of any required length, by making the viscous liquor, of which the filament is formed, pass through fine perforations in the organ appointed for spinning. But the pinna and mussel form their threads in a mould situated within the organ, which determines the length of each filament. The work of the land animals, therefore, may be likened to that of the wire-drawer, while the labour of the sea animals may be compared to those of the founder, who casts metals in a mould." The silk is most abundant in some of the large pinna or fan shells. In early times it was woven into articles of dress for royal personages, nowadays chiefly for curiosities. At a few places in Italy the silk is still woven, with real silk, into gloves and stockings, but the industry is gradually dying out.

The curious little cylindrical shell, *Helix acuta* (formerly known as *Bulimus acutus*), which frequents sandhills on the south and west coasts of England, also Abergele in North Wales, Tenby in South Wales, and Cork and Portmarnock in Ireland. It is of great interest as being one of the few survivors of an ancient fauna which reached this country long ages ago from South-west Europe. It never occurs below high-water mark, but it dies if taken to an inland district.

VI. STAR-FISH, SEA URCHINS, &c.—Various specimens in alcohol, including the Shetland Argus, Common Sea Urchin, Star-fish, Sand-star, &c. Dried specimens of Sea Urchins with and without spines. Dissected jaws of Sea Urchins. Fossil examples of Star-fish (*Ophioderma egertoni*, from the Lias) and Sea Urchins (*Cidaris vesiculosa*, *Micraster*, &c., from the Chalk).

The objects mentioned above are almost all easily procured, and they would constitute a very respectable nucleus for a Seaside Museum. They should, of course, be supplemented by a Vivarium, and should be displayed without crowding, and well labelled. Illustrations, plates and engravings might be multiplied almost indefinitely and with but little cost.

ON MUSHROOM EATING.

The peculiar conditions of the summer which is now passing have not been favourable to the growth of mushrooms, but their season is now come. The surface soil is well warmed, and some continuous and genial showers are all that is needed to cause the spawn to develop. The present is therefore an appropriate season for discussion as to the usefulness of fungi as food and the dangers which attend their employment. In England, although a very large number of fungi are regarded as edible by fungologists and many of them highly eulogised, yet but very few have gained popular acceptance. It is otherwise on the Continent, and it singularly happens that several which we carefully avoid are eaten freely in France and Italy, whilst our favourite, the true mushroom, is but lightly esteemed. Complaints are constantly being repeated as to the British neglect of this kind of food and loud accusations as to waste are made. That these allegations are to a certain extent well founded may be true, but at the same time it is quite possible that the supposed advantages which might accrue from the more free use of fungi as food are more than counterbalanced by real risks.

In the first place, it is by no means established that fungal growths regarded as food are in any special degree nutritious. To assert that they are comparable to animal food is probably a mistake, and it may be reasonably doubted whether, as regards health and strength, the community really loses much by their comparative neglect. That they are, many of them, delicious, and add much to the gusto of a meal, no one questions, but this is a luxury, and one for which it is possible to pay too dear. Two kinds of risk occur in connection with the eating of fungi. One pertains to the eater, and the other to the thing eaten. We recognise under the name of "idiosyncrasy" individual peculiarities which can neither be known

beforehand nor explained when revealed, which cause susceptibilities from which the majority of persons are free. Thus a person having an idiosyncrasy as regards them might be poisoned by agarics which others might eat with impunity. Seldom, or perhaps never, does such idiosyncrasy result in fatal consequences, and it is obvious that its subjects must, after some disagreeable experience, become aware of it. It is quite possible, however, that it may vary at different periods of life, and under varying conditions of health, and also as regards the cooking of the fungi and quantity taken. It may be assumed that very many cases of more or less severe disagreement from eating wholesome fungi occur in connection with personal idiosyncrasy, but it is not probable that there are any deaths. Periera relates, indeed, as an illustration of the fact that the poisonous effects of fungi depend much upon the constitution of the eater, that a French officer and his wife "died in consequence of breakfasting off some poisonous agarics which were, nevertheless, eaten by other persons in the house with impunity." It may be suggested, however, that it is exceedingly improbable that both husband and wife should be the subjects of a similar constitutional peculiarity in so extreme a form, and the facts would be more probably explained by supposing that some really poisonous fungi had got mixed with wholesome ones, and that the unfortunate couple alone partook of the former.

In connection with idiosyncrasies and the disagreements caused by non-poisonous mushrooms, it is very desirable to draw attention to the fact that their immediate effects are not their only ones. It is too much the habit to expect that if an article of food disagrees, it will do so at once, and that sickness, pain, &c., may be expected within a few hours. In the case of the poisonous fungi this is usually, though by no means invariably, the case, whilst in that of those supposed to be wholesome it is decidedly exceptional. In the latter an interval of one or two days often occurs during which there is

not the slightest sign of disagreement, and the symptoms are in connection with the nervous system rather than the stomach. In these the connection between cause and effect is usually overlooked. The attacks are mainly painful and are attended by muscular spasms, and are attributed to anything rather than their efficient antecedent, which has, perhaps, been quite forgotten. This kind of illness from good mushrooms is probably very common and may occur to those who have often eaten them without ill result.

Even in cases of acute poisoning by dangerous fungi the effects are not always immediate. They are never, however, long delayed, and since it usually happens that more than one person is involved, it is not often that their cause is overlooked. It has been common for the advocates of fungus-eating to discredit newspaper reports as to deaths from their favourite esculent. The experience recently recorded, however, by one of the most distinguished of our British fungologists places this question in a light from the influence of which it is impossible to escape. Dr. Plowright, of King's Lynn, has published the details of three series of cases occurring in his own practice, in which deaths occurred from eating the *Amanita phalloides* gathered in mistake for mushrooms. There is no obvious reason why his experience should have differed much from that of other practitioners throughout the kingdom, and after making liberal allowance for coincidence, his facts open to our imagination a very grave prospect. It may be said that such accidents are usually due to gross ignorance or carelessness, and this is probably in most instances true. Still, however, it remains the fact, that such ignorance cannot be eliminated, and further, that it is almost always those who think they are well informed who get into danger, just as it is those who think that they can swim who supply the largest contingent of the deaths from bathing. Nor must it be assumed that those most skilled in the differentiation of mushrooms always escape risk.

Periera tells us that "so strongly was the late accomplished

botanist, Professor L. C. Richard, impressed with the danger, that although no one was better acquainted with the distinctions of fungi than he was, yet he would never eat any except such as had been raised in mushroom beds in gardens."

Dr. Plowright, whose experience we have already quoted, contributed an article on "How to Discriminate between Edible and Poisonous Fungi" to *Science Gossip* in 1876. He concludes with the remark: "There is one way, and only one, by which edible fungi can be discriminated from poisonous ones with absolute certainty, and that is by a knowledge of the individual species." This amounts to an acknowledgment that, excepting in the hands of professed botanists, very few are safe.

The following is a list of the commonest and best known edible British Fungi. There are many others which are accounted good by enthusiasts, but these are all that enjoy any degree of popular favour in England or are likely to be exposed for sale:—

The Urchin of the Woods (*Hydnum repandum*). Entire plant pale yellow. August to October. Brittle, gregarious, terrestrial. It has spines instead of gill-plates.

The Oak-tongue or Beefsteak Fungus (*Fistulina hepatica*). Red, jelly-like when young. Pores pale at first, then reddish. Flesh red, streaked like beetroot. June to November. On living trunks of old oaks. Solitary.

The Dainty Bolet (*Boletus edulis*). Pileus brownish, 3 to 6 inches across, stem reticulated, pale brown, without a ring. Pores lemon colour or yellowish-green. In twos and threes under oaks in woods and meadows. July to October.

The Ink-cap (*Coprinus atramentarius*). Pileus greyish, plicated. Stem long, white and hollow. Whole plant dissolves into an inky black fluid at maturity. On rich soils or old wood, tufted. June to October.

The True Mushroom or White Pratelle (*Agaricus campestris*). The best known of our esculent fungi. There are several well-marked varieties. The so-called "Horse Mushroom'

(*Agaricus arvensis*), which grows in rings on downs and in meadows from July to October, is a distinct species. The greyish-pink gills and the yellowish flesh (when bruised) distinguish it from *campestris*. It is edible.

The Chantarelle (*Canthavellus cibarius*). Whole plant yellowish-buff; smells distinctly like ripe apricots soon after gathering. In scattered groups, chiefly in beech-woods. July to October. The thick, firm, white flesh, and the thick, distant gills, distinguish it from the poisonous *C. aurantiacus* which appears about the same time, and somewhat resembles it superficially.

St. George Mushroom (*Tricholoma gambosum*). Pileus 3 to 5 inches across, whitish. Gills white, stem without a ring. Smells of fresh meal. It grows in circles on downs and in open meadows throughout April and May.

Pasture Parasol (*Lepiota procera*). So called from its distinctive shape. Pileus brown, scaly. The very long stem is provided with a movable ring. The stem fits into the pileus as into a socket, and may be easily removed. In groups in pastures, from July to October.

Puff-balls (*Lycoperdon bovista = giganteum*, *excipuliforme*, &c., &c.) are all edible *in the young state*. They are then perfectly white and spongy within, and without a trace of yellow.

Common Morel (*Morchella esculenta*). Pileus brownish, covered with polygonal pits, stem hollow, white. Under elm trees in woods and parks in spring and summer, chiefly on limestone soils.

We have compiled the above list for the use of our readers, and rather in the hope of securing a reputation for absence of prejudice, than from any wish to suggest its practical employment. Our private conviction is that those who are zealous for themselves and families to secure continuous good health and live out all their days, will do wisely to abstain entirely. To this remark the "field" or "true mushroom" offers the only important exception. It is abundant, may be had cheaply, and is easy of recognition, even by the unlearned.

The Parasol comes, perhaps, next to it, but it is not common, and may easily be mistaken. Others which are quite safe are yet so rare that they are practically out of question. The shoemaker might, with better economy, stick to his last and earn the wherewithal to buy a real beefsteak, rather than wander about the woods seeking *Fistulina hepatica*, which, when found, is very disgusting to the eye, and, even if fairly good, only a very poor substitute for ox beef.

The conclusions suggested cannot, perhaps, be better supported than by giving, without comment, a few citations from the "Text-book of British Fungi," by Mr. Delisle Hay, a work to which is prefixed as a motto, "*To give and preserve to our use the kindly fruits of the earth, so as in due time we may enjoy them.*"

Some of Mr. Hay's names are not wholly suggestive of enjoyment. We will take them alphabetically: The Archbane, the Beelzebub's Cushion (*Boletus satanas*), the Bitterlet, the Burning Lactar, the Crocodile, the Destroyer, the Destroying Angel, the Guilty Spirit, the Infamous Clitocybe, the Leafbane, the Malignant, the Slayer, the Medusa's Head, the Repellant, the Sickener, the Sickener's sister, the Snake in the Grass, the Stinger, the Stinker, the Turnover, the Yellow Reptile, &c., &c.

Of the *Lurid bolet* Mr. Hay writes: "It is certainly eaten commonly in some countries, and has been eaten here without ill result. It seems evident then that the poison is easily dissipated, perhaps by simple boiling. But fatalities have been traced to this species."

Of *Boletus satanas:* "Its principle is irritant and violent, but, despite its name, it is scarcely so much to be dreaded as some species of other genera."

Of *Lactarius plumbeus:* "Dangerously poisonous, in quality, like the preceding."

Of *Agaricus vernus:* "Angelically beautiful, but demoniacally poisonous." "It must not be mistaken for any of the white spring esculents."

Of *Amanita phalloides:* "In growth it is enticing in appearance, and neither scent nor taste are there against it." In reference to a person who had made his diagnosis by the aid of a published plate: "I probably saved him from death by explaining his mistake," he adds; "This shows that plates are deceptive if not used in conjunction with a description of structure. I think that inferior illustrations are a snare."

Of *Agaricus bryophilus:* "Inexperienced gatherers might mistake it for an Oread. It is not very virulent."

Of *Agaricus excellens* (Amanita): "It must not be mistaken for a Parasol. Much less virulent than other amanites."

Agaricus pantherinus (Amanita). "This species must not be mistaken for a Blusher. I once ate two specimens before I knew better." Then follows a description of symptoms lasting a week, which had educational value.

Of *Phaliota aurivilla:* "It might easily be mistaken for one of the esculent phaliotes."

Of *Psalliota sylvatica:* "I have eaten it, I believe, in a dish of other Psatelles. It is narcotico-acrid, but evidently not in powerful degree."

Of *Lactarius rufus* (the Slayer): "Incontestably the most dangerous species of the genus, and has been the cause of many fatalities."

Of *Russula rubra* (the Destroyer): "Its principle is irritant, like the others, but also seems to have a stronger influence on the nervous system. One or two specimens have been sufficient to kill."

Of *Russula sardonia* (the Malignant): "It is said to be poisonous in a high degree; probably narcotic-acrid. I once found a specimen growing conjoined to a Chantarelle, a curious instance, which shows that care is always needful."

Of the *Boletus* group, which includes, let it be noticed, *luridus* and *Satanas* above mentioned, Mr. Hay writes: "Since the genus affords a considerable number of capital

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We have retained Mr. Hay's nomenclature.

esculents, and many of them very abundant, I consider it desirable to bring them well into notice. It seemed right, then, to make mention of species not actually known to be poisonous, as well as the few just described." He also adds: "Several poisonous kinds are quite bland and pleasant to the taste" (p. 202). Some do not become poisonous till they begin to decompose.

We here take leave of Mr. Hay. He is an enthusiast for mushroom-eating, but, as has been seen, a candid advocate.

It is a question of much interest for the farmer, and one which has, as yet, received little or no attention, whether the deaths of sheep, cattle and horses may not sometimes be caused by their having eaten poisonous fungi. Sheep do unquestionably sometimes nibble at the Russulas and *Amanita phalloides*, and they also sometimes die with all the symptoms of agaric poisoning.

Children appear to be especially susceptible as regards mushroom poisoning; and those who, despite all warning, incline to experiment on themselves, may be entreated not to allow their children to eat them. All forms of cooking render the poisonous mushrooms less hurtful, and boiling in salt water, or the free use of salt and vinegar, appear to be efficient in destroying the virulence even of some of the worst.

As regards wholesome mushrooms, the quantity taken is of much importance. It fortunately happens that for flavouring very small quantities are sufficient or even better than larger ones.

It cannot be too extensively known that the symptoms of disagreement from sound mushrooms may often be wholly deferred for a day or two. Thus many cases of summer or autumn illness attended by much pain and distress are never referred to their true cause. These are the cases to which we have already alluded as examples of idiosyncrasy.

ON THE POTATO DISEASE.

For the benefit of those hitherto uninstructed we may explain that the potato disease is caused by the growth, upon and in the plant, of a minute fungus. This fungus has, like many others, thread-like prolongations which project themselves within the substance of the stem and leaves to quite indefinite lengths. So long as these do not come to the surface they possibly do not much harm, but, unfortunately, they have a tendency to bud outwards and to produce on the surface what may be regarded as the flowers of the plant, and when these are formed the portion of the plant on which they occur is killed and becomes black. These "flowers" are easily seen as a delicate white growth on the leaf or corolla, and upon them are formed what we may call seeds with great rapidity and in enormous numbers. These seeds may be carried away in moisture or blown as dust in the air. Each seed is capable of a certain amount of individual movement, and this faculty has gained for them the name of zoospores, that is, spores which behave like animals. They can implant themselves on any suitable plant and may flourish amazingly. They do not in this instance find any plants suitable except the potato and others of the potato family (*Solanaceæ*), the black nightshade, bittersweet, the tomato, &c.

Thus, then, it is clear that a potato plot may become diseased in two different ways. The threads of the fungus may have grown up from the "set" and be, as we have ventured to call it, "flowering-out" on the leaves, or the leaves may have been attacked by dust-blown or rain-carried zoospores. In the one case the disease is acquired, in the other inherited from the parent "set." In the one case we might expect that the lower parts of the plants would be

FIG. 1.—In this instance three of the seven flowers have fallen in natural course. Of the three footstalks two are black and shrivelled, but the third is not so. Of the two which are black it may be inferred that the flowers were attacked just when they were about to fall, and that the fungus travelled down the footstalk. The four flowers are all drooping, and with their footstalks blackened. The disease has overtaken them before they had accomplished their normal detachment. Note in all the abrupt limitations of the disease.

FIG. 2.—In this figure one flower remains unaffected; in another one petal has not yet been blackened. All the others are killed and blackened. Two footstalks from which flowers have fallen in normal course are seen to be unattacked. Note the abrupt limitation of the blackened condition in the flower footstalks; the main stem remains healthy, shewing that the disease began from the flower itself.

first to show manifestations, in the other more likely the tops. When the petals of the flowers themselves are the first to be attacked we may feel almost certain that air-infection has occurred.

Infection of the flower itself is not a very common occurrence, but in years gone by the writer has collected several examples of it and has had sketches made. Two of these are copied in the appended illustrations. These show the flowers and their footstalks withered and black. The blackness in each instance ends abruptly at a certain distance down the stalk, showing that the fungus was advancing downwards and proving also, perhaps, that in some instances its advance may be limited. In fig. 2 it will be seen that one flower remains quite healthy and that even in one and the same flower certain petals may remain healthy whilst others are shrivelled. During the present season but few examples of petal-infection have been gathered, but in one instance the entire head with all the footstalks and the stem for two inches downwards was found black and dry, whilst immediately below the dead portion the stem remained as thick and fleshy as ever and quite green. (See additional statements, page 225.)

Thus far, beyond implying that a diseased "set" may infect the growing stem and send up its fungus threads to flower out in the leaves, we have said nothing as to the tubers. This, for the cultivator, is the all-important matter. The well-known fact is that the tubers from diseased plants are liable to decay soon after they are taken out of the earth. This is the "potato rot" which caused the famine in Ireland, and which has since been every year very prejudicial to our food-supply. How does the fungus get into the tubers? That is the most urgent question. There can be little doubt that when the leaves and stem are affected the fungus may grow downwards and so reach the tuber. It is, also, of course, possible that the tubers might be directly infected by zoospores present in the soil. This probably does occur to a certain

extent and it should be carefully guarded against by efficient "earthing." It is, however, not likely that it accounts for much of what occurs, and either inheritance from the parent "sets" or air-infection are in all probability by very far the most common causes of loss of the crop. The rapidity with which in damp weather the disease may spread over a large field is tolerably conclusive evidence of aerial convection. It is possible, even perhaps probable, that the disease may take its beginning every year in any given district from infected "sets," but when once it has been developed there can be no doubt that the zoospores given off by the leaves are the cause of its prevalence.

The possibility of infection from diseased "sets" has long been assumed. It has recently been demonstrated by some interesting experiments conducted by Mr. George Massee, F.L.S. In an article in the *Kew Bulletin* (No. 4, 1906), Mr. Massee has detailed experiments which conclusively prove that hybernating mycelium in a tuber is capable, under favourable conditions, of perpetuating the disease.

"Three diseased potato tubers, showing rusty stains characteristic of the presence of Phytophthora mycelium in the flesh, were each cut into two equal parts. Each half-tuber was planted separately in a plant-pot; the same kind of soil and manure, sterilised by steam, was used in all the experiments. Three of the pots were placed in a house having a temperature ranging between 70° and 80° F., in dull light, and with the moisture often at saturation point. Each pot was placed under a bell-jar. The three remaining pots were placed in a well-lighted house, without any artificial heat, and with an exceptionally dry atmosphere. These pots were not placed under bell-jars. An equal amount of water was supplied to each of the six pots. The three plants grown under conditions of high temperature, dull light, and much moisture in the air, showed the first indication of Phytophthora when shoots were six weeks old, and a fortnight later the three plants were blackened and destroyed by the fungus.

"The three plants grown in the cool, well-lighted, dry house, showed no trace of disease at the end of two months, when one of the plants was removed and placed under a bell-jar. Within nine days this plant was blackened and killed by the

fungus. A fortnight later a second plant was removed from the cool to the warm house and placed under a bell-jar. Within a week of the removal of this plant, it also was covered with Phytophthora. The third plant continued growing in the cool house for thirteen weeks, and remained perfectly free from *obvious* disease."

There is another direction by which the same conclusion may be reached. Let any one who has a potato plot in which the disease is showing itself dig up some of the diseased plants and examine what remains of the "set." It is, perhaps, generally supposed that these sets (portions of underground stem, carrying buds) rot away after their buds have developed. This is not always the case. They are almost always eaten to some extent by larvæ and sometimes they are destroyed by decay, but very often portions of them remain almost sound, and now and then almost the whole is still there and in a sufficiently vigorous condition to be attempting to put forth new buds. It is not difficult to decide whether these sets show signs of disease and in a certain number of cases these will be quite definite. Discolorations will be seen, exactly like those which occur in gathered tubers in autumn. The results from the writer's investigations in a potato garden at Haslemere have been to show that in some instances the set appears to be quite sound, whilst in some it is obviously diseased, and that in the latter the lower leaves are usually diseased and the topmost may be free. In very few instances did any of this year's tubers show the slightest trace of disease.

It will, of course, be asked why, if the fungus be present in the sets, it does not cause them to rot? The answer to this is a little difficult, but we may fall back on Massee's experiments for conclusive proof that it does not always do so. It may be suggested that in some instances the vital endowments of the living tuber are sufficient to counteract the activity of the parasite and that the latter can only assert its power when the set is enfeebled by the production of its progeny. This would be quite in accordance with much that

is known as to the possible quiescence of parasitic germs and the conditions under which they assume activity.[1]

The conclusions suggested make it evident that in order to prevent the spreading of the disease attention should be given in two different directions. The utmost care should be taken to avoid planting as sets tubers which may have the fungus in them. When evidences of disease appear in the leaves, measures should be taken, either by the use of spray or removal of the affected haulm, to prevent both spreading in the air and downward growth into the young tubers.

The facts to which we have adverted as to restricted advance prove that some plants are more susceptible than others. It is very common to see a few spots on the leaves, which remain quite local, just as is the case with the attacks on the corolla.

Notes on the Potato Disease.

It is said to have first appeared about 1841, near Boston, U.S., and to have spread over Europe four years later. It is not so virulent now as during the first decade of its invasion.

The brownish patches on the leaves are the first indications of its presence. Under a pocket lens a number of white threads will be seen on the brown patch, especially towards its edges. Under a microscope these threads will be seen to spring singly, or more usually in clusters, through the stomata of the leaf. They bear globular, colourless spores—the conidia or summer fruit. After a spore is produced at the tip of a thread (*conidiophore*), the latter continues to grow in the same straight line, and ultimately produces a second conidium, and so on. A conidium germinates as soon as mature, and produces zoospores (usually six) as soon as it is moistened. A zoospore has a pair of cilia which enables it freely to move about in the water. Finally it settles down and germinates, producing a slender germ tube, entering a leaf either through a stoma or by boring through its cuticle.

Rainstorms wash the conidia down upon the tubers, the resulting zoospores enter the latter, and are said to form a latent mycelium in

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[1] This winter-latency of material which yet retains its vitality is quaintly referred to by Herbert—

> "It was gone
> Quite under ground ; as flowers depart
> To see their mother-root, when they have blown.
> Where they together,
> All the hard weather,
> Dead to the world, keep house unknown."

the tubers. The mycelium may also pass down the diseased stems and thus infect the tubers.

Mr. Massee remarks (*Journal of the Board of Agriculture*, July, 1906) "that mycelium can be easily demonstrated in diseased tubers. This, and the fact that a field of potatoes, apparently healthy and vigorous, may within twenty-four hours, under suitable climatic conditions, be reduced to a blackened fœtid state, suggested the following experiments (see page 196), which tend to show that vigorous mycelium may just as well be the cause of the epidemic as the rapid diffusion of spores."

Mr. Massee observes that "in every fungus epidemic proved to be due to the diffusion of spores, the disease always originates from one or more primary centres of infection, and gradually extends; whereas, in the case of the potato disease the appearance of the epidemic is often simultaneous over a considerable area." In reply to this it may be plausibly suggested that there are probably many primary centres in the case of the potato field. Nothing is more probable.

The influence of warmth and moisture is shown chiefly in favouring the germination of the zoospores.

It may be that hot, dry weather favours the diffusion of zoospores by wind. It is possible that insects may carry the zoospores from plant to plant. Perhaps it is by this means that the corolla of flowers is sometimes infected.

There is a strong impression amongst potato-growers that certain hybrids will resist the disease for a time, but after a few generations suffer as much as their predecessors. What constitutes resistance? In the case of tuber infection it is probable that a thick skin (epidermis) will be very useful in rendering difficult the entrance of the spores. So also in respect to the leaves and petals, it may be that in some plants these are less easily pervious than in others. It is, however, not improbable that the transitory immunity so frequently observed in hybrids is explained by the fact that none of the tubers planted contained mycelium, they having all been carefully selected. By degrees, as the cultivation of the hybrid became more and more extensive, there would be increasing risk of infected seed tubers.

An all-important problem as regards the prevention of the disease is that which concerns the wintering of its germs. Is this usually effected in the tubers kept for planting, or in the soil, or in refuse of the last year's crop left about in the field? As regards the question of early removal of the haulm when disease is shown, it is clear that it must be answered differently according to the opinion entertained as to the mode in which the parasite has gained access. If it has grown upwards from the tuber it can obviously do nothing as protecting the new crop. It may, however, still be very beneficial in protecting the adjacent plants and the soil. If, on the other hand,

the infection has been aerial, then prompt removal of the foliage may save the tubers. There is no doubt that if the disease has shown itself early in the season, the leafage being still in full vigour, the removal of the latter will be very prejudicial to the crop.

Marshall Ward speaks of the possibility of the disease being introduced by "a stray tuber," and then spreading, of course by aerial infection, over the whole field. Mr. Ward distinctly asserts the possibility of the fungus wintering in the tuber.

It is not very difficult to form an opinion as to whether any given plant has been infected from below or from above, that is, from its set or by its leaves. If the fungus comes from the set the whole plant will shrivel and wither, the topmost leaves dying last. Under such circumstances there will be discoloured spots on the leaves, but these do not involve the whole leaf, and the remainder is yellow. If aerial infection has occurred, the top leaves will be the first to show spots and the patches will occur on leaves otherwise healthy.

MRS. SOMERVILLE ON THUNDERSTORMS.

We extract the following from Mrs. Somerville's well-known work on the Physical Sciences. It gives an excellent summary of the principal facts and may be studied with interest and advantage as introductory to our own statements.

"The contact of earth with salt and fresh water generates positive electricity, and the contact of fresh and salt currents of water negative, so that the ocean must afford a great supply to the atmosphere; hence thunderstorms are most frequent near the coasts. When the invisible vapour rises charged with electricity into the cold regions of the atmosphere, it is condensed into cloud, in which the tension is increased because the electricity is confined to a smaller space; and if the condensation be sufficient to produce drops of rain, they carry the electricity to the ground, so that in general a shower is a conductor between the clouds and the earth. When two clouds charged with opposite kinds, but of equal tension, approach within a certain distance, the intensity increases on the sides of the clouds that are nearest to one another; and when the tension is great enough to overcome the coercive pressure of the atmosphere, a discharge takes place which causes a flash of lightning. The actual quantity of electricity in any part of a cloud is extremely small. The intensity of the flash arises from the great extent of surface over which it is spread, so that clouds may be compared to enormous Leyden jars thinly coated with electricity, which only acquires its intensity by its instantaneous condensation. The rapid and irregular motions of thunder clouds are probably more owing to strong electrical attrac-

tions and repulsions among themselves than to currents of air, though both are no doubt concerned in these hostile movements. The atmosphere becomes intensely electric on the approach of rain, hail, snow, sleet, and wind ; but it varies afterwards, and the transitions are very rapid on the approach of a thunderstorm.

"Since dry air is a non-conductor, it does not convey the electricity from the clouds to the earth, but it acquires from them an opposite kind, and when the tension is very great the force of the electricity becomes irresistible, and an interchange takes place between the clouds and the earth ; but so rapid is the motion of lightning, that it is difficult to ascertain whether it goes from the clouds to the earth or shoots upwards from the earth to the clouds, though there can be no doubt that it does both. In a storm that occurred at Manchester in June, 1835, the lightning was observed to issue from various points of a road, attended by explosions as if pistols had been fired out of the ground, and a man seems to have been killed by one of these explosions taking place under his feet. M. Gay Lussac ascertained that a flash of lightning sometimes darts more than three miles in a straight line. A person may be killed by lightning, although the explosion takes place at a distance of twenty miles, by what is called the back stroke. Suppose that the two extremities of a highly charged cloud hang down towards the earth, they will repel the electricity from the earth's surface if it be of the same kind with their own, and will attract the other kind ; and if a discharge should suddenly take place at one end of the cloud, the equilibrium will be instantly restored by a flash at that point of the earth which is under the other. Though the back stroke is often sufficiently powerful to destroy life, it is never so terrible in its effects as the direct stroke, which is often of very great intensity. Instances have occurred where large masses of iron and stone, and even many feet of a stone wall, have been carried to a considerable distance by a stroke of lightning. Rocks and the tops of mountains often bear the marks of fusion from its intense heat. An insulated conductor on the approach of a storm gives out such quantities of sparks that it is dangerous to approach it, as was fatally experienced by Professor Richman at Petersburg, who was struck dead by a globe of fire from the extremity of a conductor, while making experiments on atmospheric electricity. Copper conductors afford the best protection, especially if they expose a broad surface, since electricity is conveyed along the surface of bodies. There is no instance of an electric cloud of high tension being dispelled by a conductor, yet those invented by Sir William Snow Harris, and universally employed in the navy, afford a complete protection in the most imminent danger. The 'Shannon,' a 50-gun frigate, commanded by the brave and lamented Sir William Peel, was enveloped in a thunderstorm when about 90 miles to the N.W. of Java. It

began at 50 minutes past 4 in the afternoon; the ship was driven before the storm, in a high sea, amid streams of vivid lightning, deafening thunder, hail, and rain. At 5 o'clock an immense ball of fire covered the main-topgallant mast, ran up the royal pole, and exploded in the air, with a terrific concussion, covering all the surrounding space with sparks of electric light, which were driven rapidly to leeward by the wind. Fifteen minutes later an immense mass of lightning struck the mainmast, attended by a violent gust of wind; and another heavy discharge fell on it a quarter of an hour afterwards. From that time till 6 o'clock the ship was continually encompassed by sharp forked lightning, accompanied by incessant peals of thunder. Though actually enveloped in electricity, and struck three times, neither the hull nor the rigging sustained the slightest injury.

"When the air is rarefied by heat, its coercive power is diminished, so that the electricity escapes from the clouds in those lambent diffuse flashes without thunder so frequent on warm summer evenings; and when the atmosphere is highly charged with electricity, it not unfrequently happens that electric light, in the form of a star is seen on the topmasts and yard-arms of ships. In 1831 the French officers at Algiers were surprised to see brushes of light on the heads of their comrades, and at the points of their fingers when they held up their hands. This phenomenon was well known to the ancients, who reckoned it a lucky omen."

ON TREES STRUCK BY LIGHTNING.

ALTHOUGH we had on page 118 some pleasure in triumphing by the production of statistics, over our esteemed correspondent Mr. Harvie Brown (who suggested that the beech was immune from lightning-strokes) we have still greater pleasure in now admitting that we were all the time to a large extent in accord with his opinion. Statistics are open to many fallacies, and whilst those which we adduced must certainly be allowed to prove that the beech is sometimes struck, they probably exaggerated the frequency very much. As compared with other trees the beech rarely suffers. The oak stands far ahead of all other trees in its liability. Can this be explained? A suggestion may perhaps be ventured. Oaks are above all other trees liable to retain dead branches, and to become more or less what is known as "stag-headed." In beeches there is seldom or never any dead wood, in oaks it is

common, and not unfrequently the dead branch is a large one and projects far towards the circumference of the tree. It is well known that lightning rarely strikes the very tops of trees, but usually rushes to the bole lower down, guided by some branch. We have but to suppose that broken and dead wood, moistened as it usually is in rain, offers a more attractive point and better conduction than a leafy and living bough. Apart from actual demonstration, this is highly probable. If the facts were proven they would go far to explain the excessive liability of the oak.

The subject is, however, a complicated one, and very probably no single explanation will suffice for all cases. Experiments which are referred to by Flammarion appear to have proved that oak wood is much more easily penetrated by the electric spark than is the wood of beech. In this susceptibility black poplar and willow share with oak, though in a rather less degree. In what way this susceptibility would influence the proneness to receive the lightning flash may require some consideration. It may possibly be of importance in reference to the splintering and killing of the tree as a whole. We shall recur to the subject and invite our readers to supply us with carefully observed facts.

It is possible that in investigating the peculiarities in different trees as explanatory of their liability to be struck by lightning, too much attention has been given to the conducting power of the wood. So far from this being necessarily an element of danger to the tree, it may be one of safety, and at any rate it is only one amongst many contributing influences which may modify the kind of damage done.

It is to be remembered that during a thunderstorm the earth and the clouds are in opposite states of electric tension, and, so to speak, straining to get at each other. Although in most instances the current passes downwards to the earth, it no doubt sometimes passes upwards from the earth. Every object on the earth's surface is at the moment charged with electricity, each according to its storage capacity. Thus it

may be that the storage capacity, rather than the conductivity of different trees, is the main element in determining which shall be struck.

It is necessary also to take into account the forms of the leaves and direction of the twigs. Pointed structures receive and give off the electric current more easily than blunt ones. Thus the erect stems of fir trees and the comparatively erect twigs of the oak may be more efficient than the drooping ends of the leaf-covered branches of the beech.

Our domestic animals are much more easily killed by lightning than human beings. This may be because the points of their hairs attract the fluid.

In all observations on the effect of lightning on trees, care should be taken to record the time of year. If the accident should happen in spring, when the sap is in full descent between bark and bole (in the cambium layer), the current would find its easiest path in that layer. It would by its heat produce steam, and thus loosen the bark or perhaps blow it completely off. In such case the bole might not be shattered, but simply denuded. The denudation might not involve the whole circumference, and then the tree might not be killed. Late in the autumn there is somewhat more risk that the fluid may pass down the wood itself, since the layer under the bark would be less efficiently conductive.

Probably the instances in which the current passes down under the bark are far more numerous than those in which it involves the wood itself. Yet we record for the most part only the latter, for the damage done in the former is often not at first conspicuous. It is in the after-growth of the tree that furrows reveal the fact.

The striking of trees by lightning is probably far more common than is generally supposed. A little search in almost any wood will discover trees which have been fluted by tearing up their bark, whilst those which have been broken or shattered are very rare. It is just possible that we have more than our share of lightning-struck trees at Haslemere. The sandstone

of the district contains much iron, and may perhaps be attractive to electric-laden clouds.

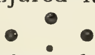
In a copse at Combeswell there stands an oak of about three feet in girth, the central trunk of which is in a condition of touchwood. On one side there is a long gaping slit seven inches wide, which exposes the contained dead trunk, but on the other two-thirds the bark is sound and the tree as a whole is living. At the margins of the slit the bark and recently formed wood curl inwards on themselves. There is a very narrow scar on the opposite side, which has closed in. The suggestion in this instance is that the tree was severely struck by lightning some years ago, that its bark was extensively detached, and that on the side where the gap now is it was torn up, whilst the wood of the bole was so much damaged that much of it died. The death, however, did not involve quite the whole trunk. The bark and a layer of wood on the side opposite the present gap remained alive and continued afterwards to form new wood and to push forwards, enclosing the dead portion and partially bridging over the gap.

It is evident in this instance that the flash struck a branch, and not the top of the tree. The branch enters about twelve feet from the ground, and at this point the damage begins. The upper part of the tree is uninjured. The branch is still present, quite dead, of course, and several branches near it are also dead, killed, no doubt, by scorching.

Another oak in a copse not far from the tree above described shows a long straight furrow down its bole. The furrow is an inch or more deep, and begins where a dead branch enters about twelve feet from the ground, and ends abruptly six inches from it. The bark has healed over the furrow, but on each side its edges are curled in, as has been described above. No doubt the lightning entered by the branch and ran down in the cambium layer, stripping up the bark, but not injuring the bole deeply. Probably the injury occurred in spring when cambium sap was abundant.

In a plantation near Haselhurst stand in a triangle three

dead trees. One is a Scotch fir, one a larch, and the third is a Douglas spruce.

They are all young, not more than twelve years old, all planted at the same time, and all in good health until three or four years ago. They are surrounded on three sides by other trees of the same age, all of which are in vigorous health. One side they are open to the meadow, and from the centre of them in this aspect a tree has been cut down. Unfortunately, no record has been kept as to why this tree was removed, but presumably it was dead, and that its death was obvious at a time when the three behind it and its sides were not seen to be damaged. The problem is, what can have killed these three trees? It could not have been anything in the soil or the exposure, for the trees close around them are flourishing; nor could it have been the attacks of any fungus, for they are of three different species, and they are all quite dead, and all died suddenly at the same time. The only plausible hypothesis seems to be that the central tree (which has been removed) was killed by lightning, and that the globe of sudden and momentary heat which surrounded it so injured its three neighbours that they subsequently died.  The relative position of the four is indicated by these dots, the smaller one representing the position of the one supposed to have been struck.

MEMORANDA RESPECTING LIGHTNING.

Wheatstone, by careful experiment, proved that some lightning does not last the thousandth part of a second. In most instances it is probably somewhat longer than this.

Lightning flashes in most instances pass from one cloud to another, but sometimes from a cloud to the earth.

The heat attending lightning is intense, but it lasts for an inconceivably short space of time: thus, it may melt metal in contact with gunpowder, and fail to ignite the powder.

It may sometimes be the case that the extreme heat may kill an animal without any traces of scorching.

Four men taking shelter together were all killed. One of them still held between finger and thumb a pinch of snuff; a second had one hand on the head of a dog which was dead on his knees, and held in his other hand a piece of bread; whilst a third sat with his eyes open gazing in the direction from which the storm came.

A young man who was killed by lightning had the nails torn out of his boots and the links of his silver watch-chain fused together. M. Flammarion, who narrates these cases, adds that to melt silver in this way a heat of 987° is needed.

Lightning has a remarkable aptitude for stripping off the clothes of those whom it strikes. It will tear off the heaviest boots, and may leave its victim unhurt but quite naked. This is probably by the sudden conversion into steam of moisture on the surface of the body.

A similar explanation applies to the stripping of the bark off trees.

We have to consider (1) the lightning flash, (2) diffused or sheet lightning, and (3) the fire-ball or meteor.

It is recorded that an ox, red with white spots, was struck by lightning, and that the effect was to singe off the white hair, whilst the red was left.

Animals are more easily killed by lightning than human beings. It may be that the points of their hair serve to attract the electricity.

It is asserted that the flesh of animals killed by electricity, if cooked immediately, is good and tender, but it rapidly decomposes and becomes uneatable. Franklin tried that of chickens.

Under the head of fire-balls or meteors we have to deal first with those originating at great elevation and known as shooting-stars, concerning the nature of which much is now known, and those which are part of the phenomena of a terrestrial electric storm. Concerning the latter there is much

that is difficult of comprehension, and much that is very doubtful as to narration. There seems, however, no reason to doubt that globes of what looks like fire, and which move slowly sometimes and sometimes rapidly, and are prone to explode with force, are occasionally produced in connection with storms or electric disturbance.

A STUDY OF PEA-PODS.

The pea-pod has a stalk. At the top of the stalk is a rounded enlargement, and above this are five oval leaves, each with a point. A quite definite line marks where these calyx leaves join the rounded enlargement, and the latter is of a deeper green in colour than are the sepals of the calyx. The sepals of the calyx cannot be pulled off separately, for they are united at the sides (coherent) just where they become attached. We will tear them all away. We now observe around the base of the pod springing from the rounded knob some very delicate threads, which are the persisting filaments of the stamens. We note that a number of them are webbed together in a half transparent, satiny membrane, in which their lines may still be traced. They have lost their anthers long ago, and are themselves in process of withering. We may now give a name to the rounded knob upon which we have found mounted the sepals and the remains of the stamens, as well as the pod itself, and as it has received all these we may call it the Receptacle.

Turning attention now to the pod itself, we see that it is keel-shaped, or like the blade of a straight-backed knife, and that its straight back is more directly continuous with the receptacle, and also thicker and stronger than its convex edge. Where the two meet at a point there projects an erect flagstaff, a quarter of an inch high. This is the withered

remains of the style of the pistil, below or behind which the pod itself has formed. Now hold the pod up to a strong light, and you will see that ranged along one or other of its borders are a number of bodies, larger or smaller, according to the age of the pea, which are mounted on very short foot-stalks. These are, of course, the pea-seeds themselves. They are attached to a soft structure formed on the inside of the shell, which is called a placenta. The structure which fixes them is the "cord" (funis or funicle), and through it will pass the juices which enable the pea-seed to swell and grow. These seeds are placed alternately one on either side of the line from which they spring. If you carefully separate the two halves of the pod half the peas will go with one half and the rest with the other. From which edge of the pod do the seeds spring, the knife back or the edge of its blade? Every one who has ever shelled peas knows that by nipping them they are easily made to burst open, but it is not every one who knows which edge first gives way. The pod represents a folded leaf, and one border is the midrib of the leaf, and the other its edges which have joined. To these in the pod the name "sutures" is given, and one is the upper and the other the lower. The former is usually the straight one and the latter the curved. The straight one usually represents the joined borders of the folded leaf, and the latter the midrib of the leaf. From the straight suture it is that the buds arise from which the seeds grow. It is the opposite suture which most easily tears open (in shelling peas).

Broad beans have their seeds attached to the suture on the curve, whilst sweet peas as a rule have their seeds attached to the straight suture. In these also the remains of the style always runs with this border. In the kitchen garden pea some have their seeds under the straight suture, and some under that which is curved. Nor does the position of the remnant of the style help much.

It is not possible in seed-pods of this family of plants to determine by the curve which is the one which will have

the placenta and the seeds. The curve may vary, and sometimes neither border seems more curved than its fellow. In all cases we must note which suture looks the thickest, for that will be one which bears the seeds. It is the thickest and strongest, because it is the one which is backed up by the placenta, and the other being the weaker is the one to give way first. Every one who has shelled peas knows that when the pod has been made to split the peas remain in line along the bottom of the opened pod. From this position it is usual to dislodge them by the back of the thumb-nail.

In order to realise that the pod is, in embryo, constructed by the folding of a leaf, take any long oval leaf and place its free borders together. It may seem curious that this joining of the edges (or suture) should become the strongest part, for it would seem more likely that the midrib would be so. It is, as we have said, the subsequent growth of the placenta which strengthens it. It is not very difficult to assign a reason for the growth of the placenta and seeds at this suture, rather than at the other, for the free borders of leaves are their growing parts, and much more prone to new developments than the central midrib, which is a fixture.

HOW THE SWEET-PEA PROTECTS ITS SEED-VESSEL.

Before the last sweet-pea of the season has withered, let us go and gather it, and together with it get some seed-pods in different stages of their growth. We shall find them well worthy of study. The flower consists of its banner or "vexillum," the large upper petal, and of two side ones, its "wings." Pull these off and we have left two modified petals, which did not previously constitute much of the beauty of the flower, and which serve a quite special object. They are folded upwards to protect the reproductive organs and within

them are concealed the pistil and the stamens. From their curved shape they are named "the keel." It is only faintly coloured, and is open by a slit in its upper edge, but usually closed below. At its very end the projecting tip of the pistil (the stigma) may probably be seen. Carefully tear off and remove the petal portions of this keel. You will disclose an inch-long slender bar, glistening and greyish-white on its surface, and ending in front by a circlet or collar formed by the anthers of a number of stamens, from the midst of which the pistil, as we have already seen, conspicuously projects. The greyish-white surface just mentioned is a delicate tissue-paper-like membrane, made up of the filaments of these stamens, which have joined together at their sides (become coherent), and constitute a sheath for the seed-vessel within, which latter gives solidity to the whole structure. From this examination of the flower and the young seed-vessel turn now to a well-grown pod. This is shaped like a straight-backed knife, with a sort of join (a suture) above and below, and a little eighth of an inch bowsprit or flagstaff at its extremity. Along its upper or straight suture, which, by the way, is the thickest one, you will easily detect a row of seeds. There are none along the lower edge. The pod has now no sheath, and it is green, not grey. If we look, however, at its base, close within the green leaves which are the remains of the calyx, and just under the lower edge of the pod, you will find a short bit of ribbed satiny membrane fringed at its front edge and firmly attached behind. This structure is what remains of the delicate tube which in an earlier stage ensheathed the whole pod. The sheath has been torn open by the force of the onward-growing and swelling pod, and it has given way by a long slit of its upper surface. If we look a little closer we shall see that this slitting by distension has not occurred at random, but that arrangements were made for it beforehand. It is not a single tear, as at first sight it looked, nor has it occurred exactly in the middle line. A single stamen has been left solitary on the upper surface, the

tearing having taken place on each side of it. Although in the first instance the sheathing membrane looked complete and equally strong in all parts it was not really so, the rest of the filaments did not cohere with this one as firmly as they did with each other.

We have now examined two most interesting arrangements made for the protection of the young seed-vessel; first, the keel formed by the petals, secondly, the sheath formed by the stamens. We have seen how the latter is got rid of when it has served its purpose, but there is yet a word to be said as to what happens to the petals forming the keel. This structure withers like the other petals as the flower ages, but, persevering in its mission, it does not at once fall off. It loosens at its base and remains as a detached cap, covering and protecting the end of the growing pod. Now and then it fails to accomplish its detachment cleverly and may remain fixed at one or other part of its base. When this happens the cap over the end of the pod impedes its forward growth and causes the pod to be bent backwards and twisted. If you make search over a long row of peas you are almost sure to find a few bent pods, and this is the way the bending is produced. Exactly the same sometimes happens with the "night-cap" of the eschscholtzia. There is a difference, however, between the eschscholtzia cap and that of the pea. The one is the whole calyx, and the other two petals (the keel).

It is impossible to contemplate the really wonderful arrangements which we have described, and to remember at the same time that they are the results of inheritance, without accepting them as evidences of the long duration of time. In all members of the pea family (*Papilionaceæ*) the protection of the seed-vessel is accomplished on the same general plan, but with endless minor modifications. These modifications are transmitted from generation to generation, until some of them become permanent and characterise a species. But how slow must this process have been, and how vastly long the period of time which has sufficed to accomplish and

to stereotype the life tendencies or habits which we now observe. We must further keep in mind that the pea is only one instance amongst thousands of the adaptative developments which have taken place throughout all Nature.

CABBAGE-WHITES AND CABBAGES.

It might seem a mean and pitiful procedure to proclaim a crusade against white butterflies. The delicate and beautiful creatures, which flutter about our gardens and are content with the least possible taste of honey, look very innocent and make claim on our admiring protection rather than persecution. Besides, is it just to hold an abstemious butterfly responsible for the misdoings of a greedy caterpillar. So far, however, as the economy of Nature is open to us we can only believe that it would be an immense gain if the race of white butterflies, comprising all those of its species, were brought to an end. The ravages of their larval form in cabbage plots is a really serious matter. They may, and often do, destroy a whole field. Nor is it enough for ladies to allege that they do not care for cabbage, and that the butterflies are welcome. These cabbages are not for ladies' eating, but are the food upon which our milch cows are to be fed in winter. A good cabbage field is invaluable to the farmer for profit, and to his stock for their daily food. That it should be destroyed by a set of ravenous caterpillars is intolerable.

Miss Ormerod, and many others of most humane hearts, have felt compelled to abandon the impudent sparrow to his enemies, and to admit that his deeds are, in their gross result, evil. The sparrow, however, does eat some insects and some seeds of weeds, but the white butterfly has no *per contra* account. Like the unfortunate tallow-chandler in the child's riddle, all his deeds are wicked.

It might not be in practice very difficult to exterminate these caterpillars. Attempts have hitherto been very unscientifically directed. They have been picked off the leaves by regiments of women or children, fowls have been enclosed on the plot, and various sprays have been tried. All such expedients incur the fatal caution of too late. The war should begin with the egg-layer. The butterflies are very fond of lavender.

A friend of ours, who had both lavender bushes and a cabbage field, showed his gardener a batch of butterfly's eggs on the under-surface of a cabbage leaf. They were for his edification put under a two-inch objective, and looked formidable enough. The man was made to count them, and was then supplied with a net. During the next few days more than two hundred "whites" perished.

Memoranda concerning the Cabbage-White Butterflies.

There are three British species: Large white (*Pieris brassicæ*), small white (*Pieris rapæ*), green-veined white (*Pieris napi*). Of these the large white is the most destructive and the green-veined the least.

The points of distinction between them are admirably summed up in Miss Ormerod's well-known "Manual of Injurious Insects,"[1] as follows :—

"*Eggs.*—The 'large white' lays its eggs in clusters, the two other kinds lay them singly.

"*Caterpillars.*—The caterpillar of the 'large white' is bluish-green above, with three lines of yellow, and is spotted with black, also has tufts or a sprinkling of hairs. The caterpillars of the two other kinds are green, but have no black blotches, also they are velvety. These two kinds differ from each other in the 'small white' having three yellow lines, and the 'veined white' having a row along each side of red or reddish-yellow breathing pores.

"*Chrysalids.*—The chrysalis of the 'large white' is pale greenish, spotted with black; of the 'small white,' fleshy-brown, freckled with black, and of the 'green-veined white,' pale greenish white, or yellow and freckled, with each end brown.

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[1] Second Edition, 1890, Messrs. West, Newman and Co., 5s.

"*Butterflies.*—The 'large white' usually measures about two and a half to three inches in the spread of the wings, the other two kinds are only about two inches. With regard to the markings: In the 'large white' the patch at the tip of the fore wings is much larger, blacker, and more regularly notched on the inner side than it is in the 'small white'; also the males of the 'large white' have no spot (or rarely have it) on the centre of the fore wings, whilst there is usually one in the case of the 'small white.'

"Each of the above may be easily known from the other common kind—the 'green-veined white'—by not having broad green veins on the underside of the hind wings."

The natural enemies of the caterpillars are two species of Ichneumon fly, *Microgaster glomeratus* and *Pteromalus brassicæ.* Wasps have been observed to keep the butterflies in check, attacking, for the most part, the "small white."

The chrysalids will survive great cold.

Heavy manuring to cause rapid growth of the plants will often save a crop. A badly infested one has been saved by an application of liquid manure. Hand-picking the caterpillars has been suggested as a remedy, but it must be very tedious where large crops are concerned. Shaking off the caterpillars and introducing poultry to eat them has also been advised. Sprinkling fine salt or flour of sulphur *may* be serviceable, also waterings of weak brine, lime-water, or soapsuds.

SEASONAL NOTES.—SEPTEMBER.

The Withering of Bluebells.

If you have near at hand a plot of copse which last May was blue with bluebells (*Endymion nutans*) go and look at it now. Not a leaf is left and all that you will find is a number of straw-like flower-stems bearing the remains of five or six flowers, each with its three dry persisting sepals. Note that these stand erect, whilst the flowers, as you will remember, were drooping. The flowers have long since fallen and the ripened seeds have followed. The stem is now hollow. Pull it, it will come with the greatest ease, being quite loose at the bottom, and a long tapering extremity will appear. When you have gathered this not a trace of the plant will remain above ground. Nor is any destined to appear until next spring.

A stem which is before us measures twenty-four inches, of which three are taken up by the flower-scape, more than four by the root-end, and the rest by the middle stem. The whole is so light that when it is balanced on the finger it is impossible to appreciate any weight. Now in spring this stem was solid, fleshy and heavy, and so also were the leaves. Indeed, up to a fortnight ago the stem was still succulent and was attached below to the bulb. The death and withering has been accomplished slowly. It began two months ago with the leaves, next followed the stem downwards from the top. It has only just been completed.

We may enquire with interest whether it would have been the same thing to the plant if the leaves and stem had been cut away as soon as the flowers had withered. By no means. The elaborated sap of these structures has passed downwards into the bulb and has served for its nourishment. It would have been to the detriment of the bulb if the process had been shortened by a single day. It was when this retirement of the sap was complete and the whole stem quite dead that the underground detachment was completed. Thus the plant may be deemed to have a sort of once-a-year circulation of sap. In the spring its growing-points — first of leaves and soon afterwards of flower-stem and flowers—drew up from the bulb the fluids needful for their development. Their function (seed-producing) being accomplished, their power of attraction came to an end, and the somewhat exhausted bulb in turn sets up its claim and drew downwards what it had before so liberally supplied. It withered the leaves first and next the flower-stem by its competitive attractions for the juices. It is now plump and succulent, and they are dead.

The Growth of the Yew-berry.

It must not be supposed that there is any identity as regards structure (homology) between the acorn-cup and that of the yew-berry. The cup of red wax which finally embeds the

seed of the yew is a growth from the base of the seed itself, which would otherwise remain naked; alike unprotected and unattractive. It is the growth of this beautiful cup which may now be watched with interest by any one who has a female yew-tree near at hand. It does not begin until the seed itself is fully formed; and the first indications of it are seen at the base of the seed. The yew has no seed-vessel (in botanic language, no pericarp). It has bracts around the base of its fruit, such as those which form the husk of the hazel-nut and the cup of the acorn, but these have no share in the formation of its waxy cup. So, if we may indulge in metaphor, we may say that the seed having attained its growth would appear to take pity on itself and proceeds to construct its own clothing. It begins at its foot and gradually projecting its crimson garment forward finally covers its head. Botanists will tell us that the cup is, after all, only an arillus, but it is one of the most curious as well as most beautiful of natural objects. It is comparable, with differences, to the "mace" which encloses a nutmeg.

Very Large Oak Leaves.

Our vivarium has recently possessed an oak shoot bearing unusually large leaves. One leaf measured 7½ in., one 8¼ in., and another reached 8½ in. The secret of their giantism is that they have fed in excess. In the first place the shoot grew from a stool left by the felling of a small tree, and in the second it had its end cut away in early spring. Thus it could draw from the roots of the tree and the sap sent up for the growth of the whole shoot had, by its decapitation, been, as it were, impounded in the part which remained. It was in this part that the leaves in question were grown.

A note in the *Museum Journal* records the following :—

"On September 28, 1902, we gathered oak leaves 8½ in.

long by $5\frac{1}{4}$ in. in maximum width. They grew from shoots springing from the side of a stump of a tree which had been felled the previous autumn. The tops of the shoots had been trimmed off, probably in June or July. Other leaves from the same spot almost equalled these in size. Mr. Harry Leslie recorded in *Science Gossip* (December, 1871) oak leaves from a pollard oak, measuring 11 in. long by 9 in. wide. Mr. Pratt, of Bayswater, gathered oak leaves $10\frac{1}{2}$ in. long in a lane near Ilfracombe, in the summer of 1904."

Garden Slugs.

The three common slugs of our gardens are the following: *Arion subfuscus*, *A. hortensis*, and *Agriolimax agrestis*. The most prolific of this trio of pests is the last-named. It is the little cream-white "dew-slug," easily known by its colour and copious white mucus. Sometimes the body is dotted with black, and occasionally specimens may be found of an uniformly dark tint. *Arion hortensis* is of dark colour with longitudinal greyish or black bands; slime yellowish. *Arion subfuscus* is larger than either of the above, and is reddish-brown with two faint lateral blackish bands. It may be at once recognised by the saffron-yellow mucus. The eggs, young and adults of all the above are especially abundant in August. During dry weather they hybernate beneath stones, under sticks and in the dead stalks of dahlias, &c., emerging in large numbers after showers. They should then be carefully collected and killed in boiling water.

Sycamore Leaf Fungus.

The large black spots so frequently seen on sycamore leaves in August and the following months denote the presence of the fungus *Rhytisma acerinum*. An excellent article on this leaf parasite, by Mr. W. B. Grove, may be found in the twenty-second volume of *Science Gossip* (1886). "The

spots begin to appear in June, and towards the end of July become very conspicuous. The leaves look as if they had been splashed with tar. When a tree is attacked, usually nearly every leaf is more or less spotted, and the number of spots on each leaf may reach thirty or even more. They begin with a yellowish discoloration, of a roundish form, about a quarter of an inch in diameter. The yellow spots are caused by the influence of the mycelium of the fungus on the chlorophyll of the leaf, this mycelium grows centrifugally, just beneath the epidermis, probably from a stomate, and destroys the colour of the chlorophyll as it advances. It is confined to the yellow spot, in the still green parts of the leaf no mycelium can be detected." Small round black dots next appear on the yellow areas, they increase and become confluent, until the spot is quite black excepting a narrow yellow border at its edge. "This is all that is produced of the fungus so long as the leaf remains attached to the tree; but after its fall further changes begin to take place. This is shown by a thickening and blackening of the affected part of the leaf, so that about the succeeding March the under-surface of the leaf is also blackish, and the mass of mycelium doubles or trebles the thickness of the leaf. The upper surface of the spot, which at first was dull and even, now becomes shining and wrinkled." In May the flexuous wrinkles open and the cracks become revolute. The asci containing the spores are ruptured and the latter are ejected in a cloud. If spores settle on a young sycamore leaf the hypha will enter with the tissues and thus the life-cycle is again commenced. Leaves produced later in the year remain free of disease and do not fall so quickly as diseased ones.

Flies and Fungi.

Many flies are subject to fungus epidemics in autumn, especially in damp seasons.

House-flies, apparently glued to the window pane by a

whitish substance, should be examined under a microscope, when the fructifying branches of the fungus will be easily seen. It is supposed that the spores are carried in the air to other flies, but it is possible, that, as has been lately shown in the case of the potato disease, the mycelium may be latent in its host until favourable climatic conditions prevail. It is noteworthy that diseased flies apparently congregate before death. In August, two years ago, we found large numbers of a species of Horse-fly[1] on the flower-heads of the common Plantain (*P. lanceolata*), on each flower were resting ten to thirty corpses.

The Horse-flies are carrion feeders: it may be that flies feeding habitually on carrion are more prone to the disease.

The fungus of the house-fly is known as *Empusa* (*Sporodonema*) *muscæ*. Other fungi of the same genus attack wasps and aphides.

Spangle Galls.

The spangle galls on the underside of oak leaves are very beautiful objects, and should be carefully observed with a pocket lens, or better still a microscope fitted with a low-power objective. There are only three or four British species. These galls are the alternate generation of the currant and pea galls of June and July; and from them only female flies will emerge (in March and May).

The commonest is *Neuroterus lenticularis*. It is button-like, almost flat, but very slightly raised in the centre, and is ornamented with reddish star-shaped hairs. In some seasons it is extraordinarily abundant; in August, 1904, we counted 286, 379 and 326 galls on three leaves from the same oak. The alternate generation is the currant gall (*Spathegaster baccarum*) appearing on the male inflorescence of the oak in May.

The smooth spangle (*N. læviusculus*) has a knob in its centre and the edges are slightly turned up. It is either quite smooth or with hairs around the umbo. The spring

[1] *Melanomostia mellinum.*

form is Schenck's gall (*S. albipes*), a yellowish egg-shaped gall occurring on the edges of the leaves in May.

The capped spangle gall (*N. fumipennis*) is smaller and redder than *lenticularis:* the margin is slightly uplifted as in the preceding species, but there is no umbo or projection in its centre. The spring form is the hairy pea-gall (*S. bicolor*) appearing on the leaves in June, and easily distinguished by the short white hairs which cover it.

The silk button gall (*N. numismatis*) resembles a small button covered with golden-brown silk radiating from a depression in its centre. It is sometimes remarkably abundant, and competes with *lenticularis* for the possession of a leaf. In August, 1904, we found three oak leaves with no fewer than 1,741 of these galls upon them in the proportion of 502, 558 and 681.

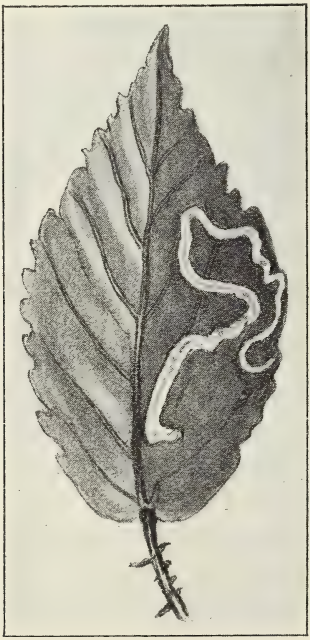
There are no indications that spangle galls will be very abundant this year.

On Leaf Miners.

Bramble leaves, showing two very dissimilar mines, are not infrequently met with in autumn. One, the familiar serpentine burrow, beginning as a minute thread and gradually increasing in width, is the work of the larva of a brilliant little golden-brown moth (*Nepticula aurella*). Leaves attacked by this miner do not pucker. In the equally familiar burrow of *Tischeria marginea*, the gallery, though slender at first, rapidly widens out, and finally appears as a large whitish blotch covering nearly half the leaf. The burrow is slightly puckered at its edges. The larva is green with a black head and two black marks on the back of the second segment; the moth has bright yellow fore-wings. The moths of these leaf miners may be bred by keeping mined leaves in small bottles, care being taken that they do not become too moist or too dry.

The following note is taken from H. T. Stainton's excellent article on "Leaf Mining Larvæ," in the third volume of *Science Gossip* (1867):—

"In the month of June we may frequently find on young oak-bushes that many of the leaves have extensive mines, occupying nearly a third of the leaf, and the part mined is so completely cleaned out that nothing is left but the two skins of the leaf, and it hence has a very flimsy appearance; on holding one of these mined leaves up to the light, we should perceive within it a mass of short, dark grey thread-like substances, being the excrement of the larva; possibly in some of the leaves we might succeed in finding the larva still there, a dull



whitish creature, with no legs, but with a well defined head, his jaws being kept constantly at work devouring the green portion of the leaf, which imparts a greenish tinge to the dorsal vessel running along the centre of its body. This larva, when full fed, quits the leaf and descends to the ground, which it enters, and there spins a subterranean cocoon, coated with particles of earth; within this cocoon it changes to the pupa state, and it is not till the following May that the imprisoned moth makes its escape and delights to fly round the oak twigs in the sunshine. It is a pretty glossy creature, about half an inch in the expanse of the wings; the fore-wings are of a pale golden green, with a faint appearance of two paler spots, one on the inner margin beyond the middle the other midway

between this and the tip of the wing; and scattered over the surface of the wings are a few purple scales; the hind-wings are rather transparent pale purplish. This we call *Micropteryx subpurpurella*. (There are many species of this same genus *Micropteryx*, which make similar mines in birch leaves.) The mines in the leaves of oak are so numerous that we frequently find several of the same genus happen to be oak-feeders, and it is by no means uncommon to find that a single oak leaf is mined simultaneously by half a dozen different species."

ADDITIONAL NOTES ON THE POTATO BLIGHT.

The following notes are to be read as an appendix to the paper concluded at page 200. They record the results of observation made for the most part since that paper was in type, and which could not, owing to printing exigencies, be conveniently inserted in their proper place. As they record solely personal observations, it seems due to the reader to sign them. JONATHAN HUTCHINSON.

It is improbable that the attack of the fungus on the flowers themselves, to which we have referred, has not been previously noticed and described by others. As, however, it is not mentioned in any work to which I have access, whilst in several it is stated in detail that the fungus usually gains entrance by the stomata of the leaf, or, exceptionally, by boring the epidermis, it seems worth while to describe in a little detail what I have observed. My first drawings illustrating these attacks (copied in the plate at page 194) were made four or five years ago, and since then until the present season I have not given much attention to the subject. During the present month (August) I have had a considerable potato plot under close observation. The plants (of various kinds) have flowered freely, and a considerable number of them in the early part of the month began to show signs of blight in their leaves. During the second fortnight they were in full flower, and in a great many instances the flowers

themselves were attacked. At this time the flowers were falling in natural course, and one of the most conspicuous evidences of disease was that the flower could not detach itself from its footstalk. Instead of dropping off, the invaded flower withers and becomes black, and its foot-stalk withers with it. The downward advance of the fungus is apparently arrested for a short time at the line of junction.[1] Many specimens show the blackening stopping abruptly at this line. After a short time, however (perhaps only a few hours), it advances beyond it and may spread down to the junction of the footstalk with the stem of the raceme. It may even spread to the whole of the latter. This, however, is unusual, and certainly the rule is for the evidences of the disease, the shrivelling and blackening, to be restricted to parts near to the flower. The mycelium may, however, be advancing rootwards without causing any external changes. The explanation of the arrest of the fungus at the "line of junction" is no doubt defective continuity of the fibro-vascular bundles. It is probably much influenced by the age of flower, the resistance being greatest in flowers about to fall. In cases in which the fungus has crossed this line, the flower seldom or never does fall. Its persistence amidst a group of truncated foot-stalks or healthy flowers is a very conspicuous proof of disease, and the condition is a very common one.

Under the microscope I have repeatedly recognised the fungus flourishing on the petals and the foot-stalk, and sometimes even on the anthers themselves. The processes are, however, very rapid, and unless the weather is favourable, it is not very easy to find specimens in an early stage. In one such, in a petal which remained translucent, I was able by transmitted light to recognise the mycelium in the petal substance. Even in cases in which the flower has fallen at the

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[1] The term "line of junction" is here used to designate that sort of neck at which the foot-stalk of the flower joins that of the raceme. It is at this line of junction that the flower is detached in the usual course of things, when the ovules have not been impregnated.

line of junction in the usual way there may sometimes be found proof that before falling the fungus had infected the footstalk, some little black points being discoverable in the upper extremity of the latter. The condition may spread later on through the whole length of the footstalk. As a rule, however, as already stated, if the line of junction be invaded, the flower will not fall.

What has been said above as to the improbability that former observers have wholly overlooked the flowers applies with equal force to the "sets." Yet I cannot find evidence that any one has thought it worth while to inspect them, or if that has been done to record the results. Of the "sets," which I have sought for during the last fortnight (August 10 to 24), in a very considerable number of instances, no trace could be detected. In two or three we found a quite empty and dry rind keeping its form without any trace of decay. In these the growing plant had apparently used up the whole of the parental substance. In others the set, although its shape and size remained recognisable, was so rotten that no special structures could be recognised. In yet others, portions of the outer part remained firm, succulent and evidently living, and in a few of these evidences of disease (brown specks and bands) were obvious. In others the whole set (an uncut potato) in its original form remained little, if at all, altered. On slicing these, traces of disease quite unmistakable were always found. I examined more than fifteen such still living sets, and found disease in all. They were not rotten but evidently living, as was proved by their being in the act of producing new sprouts.

It would be premature to base any conclusions on the observations here recorded. They must wait for confirmation or refutation by more extended experience. As they stand, however, they appear to suggest that the symbiotic presence of mycelium in a "set" exercises in some cases a sort of protective influence, preventing on the one hand the absorption of the substance of the set by the new plant, and also the

attacks of the bacterial organisms causing decay. It may be, and probably is, the fact that this sort of protection is very incomplete and only occasional, that the more ordinary occurrence is for the infected "set" to rot and disappear. That, however, it does in some instances survive in a very remarkable manner is obvious.

In all the cases to which the above observations apply, the foliage showed evidences of disease, in some more, in some less, but in all very definitely, and in most considerable.

During the last fortnight I have found the disease beginning on a considerable number of *new tubers*, always on those which were under severely diseased haulms. It appears to begin in all instances from the outside, and the conditions suggest that the skin of the tuber is the part infected. This would suggest that the zoospores are water-borne from the leaves into the soil below, and thus give support to an opinion for long extensively entertained. After many weeks of dry weather we have recently had some very heavy rains.

OUR PORTRAIT GALLERY.

See Frontispiece.

We offer our readers, with the present number, as a beginning of our Portrait Gallery, two portraits without names or comments. In our next will be given the names, a short description of physiognomical characteristics, and a space-for-time biographical schedule. In the interval the reader is left to exercise his powers of observation in deciphering the features and allotting the intellectual traits they may seem to imply. It is intended to continue these portraits for at any rate some months, and, should they prove acceptable, perhaps indefinitely. They may, in not a few instances, and to not a few readers, be recognisable. This, however, will probably not always be the case, and often,

when it is, an interval of doubt may have occurred, during which the faculty of discrimination may have been called into play unprejudiced by previous knowledge. We have no wish to offer puzzles, and our design is only to increase the habit of original observation by a temporary and brief concealment of the facts.

CORRESPONDENCE.

TO THE EDITOR OF THE "MUSEUM GAZETTE."

E. H. has kindly supplied us with the following addenda to our *Memoranda as to the Moon.*

Page 157, par. 5.—*The Materials of the Moon.* If, as is believed, the earth and moon were originally one mass, and the latter has subsequently become detached, it must be supposed that the materials of which the moon is composed are the same as those of the earth, though the *proportions* of lighter and heavier substances evidently differ in the two bodies. Perhaps, then, it would be safer to say, that while the *bulk* of the moon is a little more than one-fiftieth that of the earth its *mass* is less than one-eightieth of that of the same body. Its superficial gravity is only one-sixth ; and, as a consequence, a man on its surface could therefore leap six times as high, or throw the same missile six times as far, as he can do on the surface of the earth by the same effort.

Par. 2, page 158, might be thus continued: During half of each of these long days—such half corresponding to the duration with us of a fortnight—each portion of the moon successively experiences, without intermission, the burning heat and fierce light of the sun in a cloudless sky ; and during the other half suffers total absence of sunlight accompanied by intense cold.

It might be of interest here further to note that as the moon has lengthened its days by occupying as much time in performing one revolution round its axis as it does in revolving round the earth, it is surmised that the earth also is very gradually lengthening its days by the retardation of its axial velocity, and may be expected, ages hence, to revolve upon its axis in the same time as it revolves round the sun. This means that, should its separate existence continue sufficiently long, and under the same conditions, the earth's future day will equal in length our present year. Daylight and darkness will then be each of six months' duration. The prospect is not alluring ; but its possible realisation is so far distant that though it may well exercise our imagination it need not excite our fears.

Page 159, top of page.—"The best harvest moons occur on or near the 21st of September."

The harvest full moon occurs this year on October 2. Moon rises September 30, before sunset; October 1, seven minutes after sunset; October 2, twenty-eight minutes after sunset; October 3, fifty-three minutes after sunset; October 4, seventy-seven minutes after sunset.

The less the interval between the autumnal equinox and the harvest full moon the more marked will be the phenomenon. This year the interval will be the considerable one of nine days. The phenomenon is most conspicuous in high latitudes. In quite low ones it is hardly apparent.

C. B. draws our attention to Byron's line respecting the Mediterranean—

"Where there sinks no ebb on that tideless sea."

It is not quite accurate. There are feeble tides in this great land-locked sea. These are most perceptible at the ends of long bays: at Malta scarcely to be noticed, they are very evident at Venice at the extremity of the Adriatic. The tides in the Baltic are, like those of the Mediterranean, very poor.

High and Low Water.—The range of difference between high and low water is, of course, far greater in spring-tides than in neap-tides. It may be two or three times as great.

Critical.—You may spell the word as you prefer: Ager—Æger—Agre—Ægre. It is derived from a Saxon name for a river god.

"Mushroom," "Fungus," or "Toadstool"?—On the use of the term *Mushroom* Dr. Hay writes: "In this work the designation mushroom is used in a wide generic sense. It is intended to express any of the larger Fungi in contradistinction only to those small but numerous forms that might similarly be called moulds. Taken in this sense the word mushroom is an equivalent for the French champignon, and for the German pilze and schämme. We cannot very well employ the word Fungus in this relation, because that title has a wider signification."

A recent author on diet tells us that "The edible fungi are popularly spoken of as mushrooms, and the inedible ones as toadstools. There is really, however, no such division, for all the larger fleshy fungi are toadstools, and probably most of them are edible." The word "toadstool" is here used as if it had a real meaning, which certainly it has not. It ought surely to be left to young children, and even by them disused as soon as possible.

Plague in India.—The plague mortality in India is, we regret to know, increasing year by year. It was 80,000 in 1903, had grown to 166,000 in 1904, and to 305,000 in last year. It is now a well-

established fact that the disease is spread by the agency of rats. The natives will not, however, give any assistance in the destruction of these vermin, and will catch and surrender them only under promise that their lives shall be spared. The disease prevails chiefly in villages and small towns. When it shows itself the inhabitants prefer to vacate the place rather than assist in exterminating the rats.

ENGLISHMEN'S APPETITES.—When the British contingent to Garibaldi's Italian army was returning home, Count Cavour had the friendly foresight to give orders that its members were to be supplied with double rations, as Englishmen ate more than Italians.[1]

CONCERNING the Tobacco Plant (page 160), the Rev. E. N. Bloomfield writes: "You are, of course, aware that the Tobacco Plant is grown by entomologists because it is very attractive to some of the larger Hawk Moths, as, for instance, *Sphinx convolvuli*. The insect hovers in front of the flower, inserts its long tongue, and then sucks the honey from the bottom of the tube; when so doing the pollen is shed upon its forehead—if I may so call it—and when it sucks honey from the next flowers it leaves some pollen on their stigmas. I believe various long-tubed, especially night-flowering, plants are fertilised by these long-tongued Hawk Moths. It is therefore an advantage to the flower to keep off intruders in the way you mention. Shorter-tubed flowers are in like manner fertilised by shorter-tongued night-flying moths, as, for instance, the Petunia, which is also a favourite of the Hawk Moths."

WELLINGTONIAS STRUCK BY LIGHTNING.—Mr. Bloomfield also writes: "Are you aware that the Wellingtonia is very subject to be struck by lightning? A fine specimen in this parish (Guestling, near Hastings) was thus spoiled, as were several in Beaufort Park near here."

It would be of great interest to record the precise part of the tree struck, and its effects.—ED., *M. G.*

TO THE EDITOR OF THE "MUSEUM GAZETTE."

SIR,—Will you allow me to make one or two friendly comments upon items of information contained in your interesting MUSEUM GAZETTE?

(1) On page 114 (July) is a paragraph which make it appear that "Trypanosoma" is the name of the species of Tsetse-fly which conveys sleeping sickness. Doubtless the writer of the passage was quite aware that the fly in question is *Glossina palpalis*, and that

[1] Holyoake's "Bygones," vol. i., p. 256.

Trypanosoma is the name of the parasite introduced by it into the blood of the victim ; but as it stands, your paragraph is misleading.

(2) Page 158.—"When the moon comes between the earth and the sun . . . . . . the earth is eclipsed to the moon." Surely the very narrow path of the moon's shadow on the earth does not justify the use of the word "eclipse ?" We might almost as well say (though of course the conditions are different) that Venus in its transit "eclipses the sun ! "

(3) Page 159.—As to the existence of life, air and water on the moon, have you considered the evidence produced by Professor Pickering (see *Nature*, vol. lxxi., page 226) ? Of course, it is not conclusive, but it is very interesting, and coming from such an observer cannot be ignored.

Yours faithfully,

HENRY BURY.

Mayfield House, *Farnham*,
August 22, 1906.

(1) We are obliged to our correspondent for the correction of the misprint in reference to the Tsetse-fly.

(2) As regards the eclipse of the earth, our expression was not intended to imply completeness, but we gladly acknowledge that, as our correspondent points out, it implied too much.

(3) We had no wish to ignore Professor Pickering's most interesting speculations, and may perhaps refer to them at a future time. For the present we were content to record the generally accepted facts.—ED., *M. G.*

TO THE EDITOR OF THE "MUSEUM GAZETTE."

DEAR SIR,—Thanks for the MUSEUM GAZETTE, which I shall have great pleasure in recommending to the "Scarborough Field Naturalists' Society." I do not see how it is going to pay you at Sixpence. It is so very difficult to get a paying number of subscribers to any scientific journal. It was a good idea to do a series of seaside issues. The shells are very good. Perhaps you might follow on with some land and freshwater shells, especially as the autumn is the best time for collecting—especially the terrestrial species. Sorry you have so poor an opinion of Filey sands. They are good shell-collecting ground—most beautiful fossils, ammonites and belemnites especially, are to be got where the mud cliffs merge into the chalk.

Yours faithfully,

W. GYNGELL.

13, *Gladstone Road*, *Scarborough*.
August 25, 1906.

THE

MUSEUM GAZETTE.

No. 6. OCTOBER, 1906. Vol. I.

EDITORIAL NOTES.

In the first instance our Museum Gazette had for its alternative title, "A Journal of Objective Education." It was strongly represented to us that this latter expression might not be understood, and would repel readers. So it was changed in our second number to "A Journal of Field Study," which was intended to mean the same thing. What we wished to imply was that our Gazette would concern itself with the examination of facts, and the inspection of things themselves, rather than with merely verbal statements. For us "Objective Education," "Museum - teaching," and "Field-study" are terms which are applicable to the same pursuits.

We may fairly claim in the poet-philosopher, Goethe, a pioneer in the cause of Objective education. He loved field-study and delighted in collecting. He kept snakes in order to observe them, and he spent hours in his garden, gazing into the faces of his flowers, and speculating on the formation of their leaves and petals. From these he would, when indoors, turn to the assortment of fossils, or of fragments of rock, coins, medals, or portraits. His interest in everything that was real was intense. He seemed to read Terence's famous line, "Homo sum," &c., as if it comprised not man alone but all Nature. One of his friends wrote of him :—

"Whoever wished to recommend himself to Goethe for ever, needed only to bring him some specimen from his travels. The paw of an arctic bear or of a beaver, the tooth of a lion, the strangely twisted horn of a chamois or a deer, or any other object differing in part or wholly from familiar forms and organisations, sufficed to delight him for days and weeks, and to furnish him with matter for repeated observations."

Of the methods of education which he saw in vogue he was a severe critic.

"Young men," he said, "are driven in flocks to lecture-rooms, and are crammed, for want of any real nutriment, with quotations and words. The insight, which is wanting to the teacher, the learner is to get for himself, as he may. No great wisdom or acuteness is necessary to perceive that this is an entirely mistaken path."

The time of year is again with us which Keats apostrophised as the

> "Season of mist and mellow fruitfulness,
> Close bosom friend of the maturing sun."

The appropriate subjects for October observation, in garden and field, are the formation of fruits and seeds; the fall of the leaf and the changes in colour which leaves undergo; the preparations for winter and the anticipations of spring. The growth of the whole mushroom tribe, although at no time of year quite at standstill, is now very abundant. Autumn is the summer of the fungologists' year. In the decay of other things the stored warmth of the earth and the abundant moisture in the air, these rot-loving saprophytes find their opportunity.

We have in our Seasonal Notes (see p. 266) devoted considerable space to the various topics which we have named above.

Are any of our readers liable to Autumn melancholy? Let them watch the operations of the farmer. How promptly the plough is at work where the corn has been cut! The object in view is not to bury out of sight that most depressing of all objects, the stubble, but to prepare for seeding and next summer's growth of green. Or let him pull down a hazel-bough and observe that not only are the leaf-buds forming in all the axils, but that actual flower-buds are already there.

The catkins of the stamen flowers are, at the present time, abundant, and although they will not open till next April, they silently proclaim the perennial confidence of Nature, and whisper that "spring is coming." Let us listen to their lesson and look forward with joy and trust.

As regards the changes in colour of autumn leaves and their tendency to drop off, it may be taken as a general fact that both are caused either by age or injury. The life of the leaf is at low ebb and its vital changes can no longer be maintained. This is the main fact, the rest is detail. There is a limit of life imposed upon plants as well as on animals, which may be made to vary a little but which cannot be escaped. Senility may be hastened by the wear and tear of life or may be delayed by judicious protection, but it will come at last. In some instances we see the whole organism growing old simultaneously and in others only parts or appendages; such as the hair, teeth, and feathers in animals and the leaves in plants.

Everyone knows what it is to have cold hands and feet, and expects that the nose-end and the ears will be the parts to follow if the exposure be prolonged. The explanation is that these parts are at a disadvantage as regards the circulation of their blood, and that the cold air gets at them, as it were, on all sides. No one fears to be frost-bitten on his cheeks or his shoulders. The changes which we observe in leaves are, many of them, exactly parallel to what occur to us in cold hands or feet and of which frost-bite is a final result. Very often it is the extreme tip or the border of a leaf which suffers first. Physicians have a learned term for such changes. They speak of them as acroteric, that is, incidental to the extreme points or periphery, and when a person is very liable to have the fingers become blue or white from exposure to cold they say that he has acroteric susceptibilities. Such conditions are often, in the human subject, quite transitory, and may occur

over and over again, but in plants they usually leave their mark. The parts which have been so affected either change colour or become lifeless.

No plant affords better opportunity for the study of the changes just alluded to than does a shrub common in many gardens, a Chinese species of bistort (*Polygonum multiflorum*). The large, handsome leaves of this plant become brown at their tips. Next a margin of brown or of purplish colour surrounds the whole leaf and a very beautiful appearance results. Soon, however, bars of brown are seen passing outwards from near the mid-rib and between the large veins. These bars are always produced in the mid-distance, as far from the mid-rib and the veins as is possible. By observing their arrangement you may study the sap-supply of the leaf. The leaf keeps green longest near to its sap-vessels, but finally the whole of it is involved in death.

The newspapers have been recording with surprise, and some anxiety, the appearance of cases of leprosy in Switzerland. Why should this fell disease break out in these beautiful districts, amongst people supposed to be cleanly and well fed? There need be no great wonderment. Leprosy has never left the south of Europe, and there is always a sprinkling of it near the shores of the Mediterranean. There is a leper home at San Remo, and others in Spain. Be it observed that it is now found in a Catholic Canton, where, no doubt, the fish fasts are well observed, and that it does not spread as a contagious disease would, there being still but very few cases.

We give at pp. 259, 263, the names to the two anonymous portraits which appeared in our last issue, and also offer in our present Frontispiece, and at p. 274, two more for examination and diagnosis.

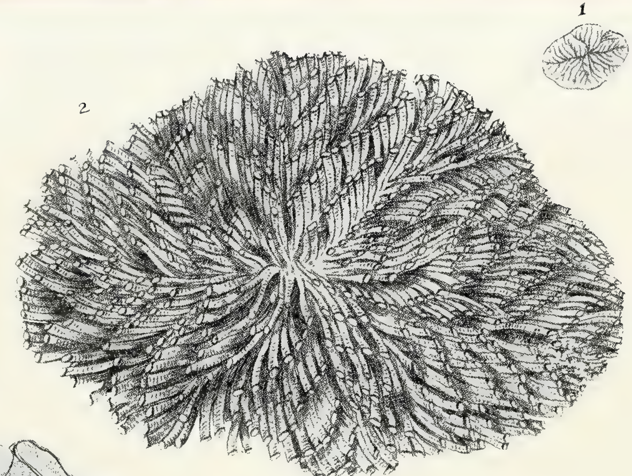

Fig. 3.

Fig. 4.

CORALLINES AND BURROWING SPONGES.

(*With plate from Johnston.*)

FIG. 1 in our plate is *Tubulipora flabellaris*, one of the Cyclostomata, or round-mouthed Bryozoans, natural size. It forms small cup-shaped incrustrations on shells, rocks and seaweed. It "appears to luxuriate on the bulb of *Laminaria bulbosa*, where it is fine indeed." Landsborough wrote of it: "It is so like the Prince of Wales' Feather that you are disposed to write 'Ich dien' underneath." It was described by Johnston under the name *T. phalangea*, but Pennington and others consider Johnston's *phalangea* and *flabellaris* as one and the same species. It forms purplish or lilac incrustations on old shells, seaweeds, &c. The tubes are long and slender, forming beautiful objects under a low power of the microscope.

Fig. 2 shows the same species magnified. (From Johnston's British Zoophytes, pl. xlvi.)

Fig. 3 depicts *Eschara foliacea* (= *Lepralia foliacea*, in Pennington's Zoophytes, p. 273), half natural size, of a Devonshire specimen, figured in Johnston's British Zoophytes, pl. lxvii.

It is the "Stony Foliaceous Coralline" of Ellis. It often forms large foliaceous masses (sometimes 20 ins. in diameter), "resembling a piece of paper in various folds, which unite so as to form cavernous passages through the mass," occasionally incrusting with a unilateral instead of quincuncial[1] arrangement of the cells. Ellis recorded it from the Isle of Wight, and the Rev. Thomas Hincks found it at Ilfracombe. It has also been recorded from the Hebrides and Isle of Man. Mr. Couch stated that very fine specimens occur on the Cornish coast; he saw one, obtained near Eddystone

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[1] Quincunx, arranged as at the corners of a square, with one in the centre.

Lighthouse, which measured 7 ft. 4 ins. in circumference and 1ft. 9ins. in depth.

Fig. 4 is taken from Johnston's 69th plate, and represents the burrowing sponge (*Cliona celata*, Grant). Oyster shells, perforated by Cliona, are abundant on our coasts. The burrow superficially resembles that of the Anobium beetle in wood and furniture, but in section the galleries are extensively lobed. In some cases the sponge bursts "through the shell and forms large cork-like masses, the identity of which with the boring portion was for a long time unsuspected." Specimens showing this condition may be seen in the British Museum. Similar ones would no doubt reward the diligent observer in many localities on our coasts. The boring sponges and the huge Neptune's cup sponges (*Poterion patera*)—a fine specimen may be seen in the Haslemere Museum — together belong to the order *Monaxonida* or *Monaxon* sponges characterised by the pin-shaped skeleton-spicules. The Cliona bores into limestone rocks as well as shells.

Professor Martin Duncan writes:[1] "The substance of this sponge, which is called Cliona (*Kleio*, to shut), consists of soft, granular, greenish-yellow protoplasm, no harder than setting strong gum and water, and it completely fills up the cavities in which it lives. It is traversed and covered with myriads of spiculæ, which are slender cylindrical tubes, slightly curved, acutely pointed at one end, and terminated by a small, hollow, round head at the other. The spiculæ of the Cliona are of flint, and are transparent, and they are not placed in contact with any muscular fibres, nor is the sponge stuff sufficiently dense to afford them a support against even slight pressure. It is necessary to mention this, because some people believe that the sponge works its spiculæ in such a manner as to drill the holes and tubes in which it is found. The oyster (shell) is hard, and

[1] "The Sea-shore," S.P.C.K., 1891, p. 78.

a corresponding amount of force is required to penetrate it if direct violence is to be employed, and this is not possible to the soft Cliona." He concludes that the sponge dissolves the shell by the carbonic acid gas which it evolves.

OVERGROWTH OF ONE MANDIBLE IN BIRDS.

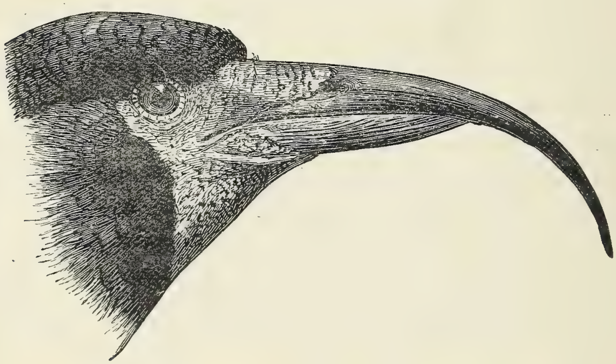
THE illustration here given is copied from one published in the *Field*, in January, 1892. It had been supplied to that journal by Messrs. Henderson, of Dundee, and was given as an instance of "extraordinary extension of the upper mandible," which was unexplained. It was added :—

> "The cause of these abnormal growths is not always evident. It is not easy to see the reason why, in the present case, where there is no lateral want of symmetry, the upper mandible should not have been equally worn down with the lower."

Our interest in asking attention to this drawing at the present time is in connection with the cause of the deformity. A specimen has recently come into our possession so exactly like that here delineated that it may be suspected that it is the same. It was presented with others to the Selby Educational Museum. Whether it be the same or not, we may feel confident that the cause was identical. Now it is quite certain that in the Selby specimen the tip of the lower mandible has been shot away. An exceedingly small portion has been removed, but sufficient to disable the beak from pecking at hard substances, and also to leave the tip of the upper mandible unopposed. Thus the case comes into line with many other examples of overgrowth from want of wearing down by use. These are seen in the case of tusks and teeth, and also in claws and hoofs. We have a series of such in the Haslemere Museum.

It is worth while to remark that the injury is not always obvious at first sight. It is not so in our drawing, and it is

not so even in our specimen. A side view reveals nothing, and an observer who had examined our bird with the especial object of finding injury, reported that there was none. More careful inspection, from below, however, made it certain that the tip of the lower beak was gone. This statement shows not only that a very slight injury may suffice, but that we must receive with caution all reports which are inconsistent with prob-



ability when no opportunity is afforded for personal verification. It may almost be asserted that it is a safe rule to believe what is probably true in spite of any evidence to the contrary. It would be of great interest to know whether Messrs. Henderson can give any additional information as to their specimen.

For the present our creed is that when one mandible is overgrown it is always in consequence of injury to the other. We invite confutation, but we must ask to be allowed to see the specimens.

EARLY ENGLISH PORTRAIT PAINTERS.

It is a great mistake to suppose that England had produced no good portrait painters before Sir Joshua Reynolds. There were three painters in England in Milton's time, two of them of native birth, any one of whom might have creditably painted his portrait. Unfortunately it is probable that none of them did so, and the only quite authentic representation of our great poet which we possess is by an engraver named Faithorne, who engraved it from his own sketch. Even his original is lost, but his engravings remain and they supply the somewhat sour-looking portrait which is well known and has, with modifications, been copied everywhere. It represents Milton in almost old age (65). There are others which not improbably are contemporary, but of which the artists are not known and the authentification is not complete.

Milton was born in 1608 and died 1674. Van Dyck died at the age of 43, in 1641. He could not, therefore, have seen Milton after he had acquired his great fame. Dobson, who might be styled the English Van Dyck, and who was called by Charles I. his British Tintoret, died in 1646, aged only 36. Walker, who painted portaits of Cromwell, Evelyn, and many others of the day, died in the same year as Van Dyck. We have in the Haslemere Museum a pleasing portrait which was catalogued at one of Christie and Manson's sales as Milton when a young man, and is conjecturally attributed to Dobson, but neither painter nor sitter can be verified. We have also a small collection of engravings from Faithorne's portrait.

William Faithorne, the engraver, was born in 1616, and was thus eight years younger than Milton. He died 1691. He had engraved portraits of Henrietta Maria, Cromwell, Fairfax, Hobbes and many others as well as Milton. His name is omitted in Pilkinton's "Dictionary of Painters," and in point of fact he never did paint.

There is in our National Portrait Gallery a fine portrait of Faithorne himself, by his friend, Robert Walker. It hangs

in the same room as that of Walker himself, by himself. Both are excellent works and exhibit men of pleasing features. To Faithorne all must be grateful for having preserved for us, as above stated, the only authentic portrait of Milton which exists. He drew in crayons. Although his original drawing is lost we have his own engraving from it, which may be considered an original work.

There are many engraved portraits of Milton. Perhaps the best existing collection of them is in the possession of Dr. J. F. Payne, F.R.S., the Hon. Librarian of the Royal College of Physicians. Walker's portrait of and by himself is engraved in the Virtue Collection. Dobson's by himself is in the same. Faithorne's is also in the same.

Amongst other able portrait painters who were in England, in or about Milton's time, the following deserve mention: Gilbert Jackson (who painted Sir John Bankes), Michael Wright, John Riley, T. Brownover, Kerseboom, James Parmentier or Parmenter. Of these, Riley and Parmentier are the only ones who have secured biographic notice in Pilkinton's "Dictionary of Painters." It is related of Riley that he was diffident of his own powers, and that had he possessed Kneller's vanity he might have more than rivalled him. It is possible that he was also not sufficiently complimentary to his noble sitters. Charles II. is said to have observed, on looking at his own portrait as given by Riley's pencil, "Od's fish! if it's like me, I am an ugly fellow." He secured favour enough, however, to be employed to paint James II. and his Queen, Mary of Modena, and after the revolution, those of William and Mary. Milton was 38 when Riley was born, and the latter could therefore have painted only an old age portrait. Riley died seventeen years after Milton, and, like him, of gout.

James Parmentier was not an Englishman by birth. He was not born till 1658, he could not, therefore, well have painted Milton. Some of his best work is in Yorkshire (Hull and Leeds). To Brownover we owe a fine portrait of Locke,

which hangs in our National Portrait Gallery. It is a much more pleasing one than the emaciated, dishevelled representation of the philosopher which, from the brush of Kneller, does duty in all illustrated biographies. Locke died twenty years after Milton and it is not unlikely that the painter of the portrait of the great thinker never saw the great poet.

AT THE BRITISH PORTRAIT GALLERY.

Take a chair in Room IX. facing the end of it. You have before you as central figure, "Prior's Kitty, ever young,"[1] the beautiful Duchess of Queensberry. She stands at full length; dressed in light grey or drab, with the accompaniments of the milkmaid whom she personates, though she is more suggestive of an aristocratic young Quakeress. She was the friend of Pope, Swift, and Prior, and the patroness of Gay. Below her to the right is the portrait of Prior himself, and in line with him James Thompson, of "The Seasons," Jonathan Richardson and George Virtue. We will not confuse Jonathan with Samuel. This Richardson was not the author of "Sir Charles Grandison," but an able painter and critic. His essay on the theory of painting excited the enthusiasm for art of Joshua Reynolds when a boy, and he has been called Reynolds' pictorial grandfather. Next to him is a specimen of his art in a fine portrait of George Virtue. To Virtue we owe a debt of gratitude as an early collector of portraits and one who did, perhaps, more than any other to promote a fondness for them and to make them accessible to all, in excellent engravings. Richardson's own portrait is also by himself, so that

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[1] Walpole wrote :—

> "To many a Kitty, Love his ear would for a day engage,
> But Prior's Kitty, ever young, obtained it for an age."
>
> (We borrow from the catalogue.)

we have here two of his productions, side by side; they are both good.

Two portraits by Kneller which hang on the left have suffered much from a green change of the flesh tints. They represent the mezzotint engraver John Smith, a refined and pleasant face, and a daughter of the Duchess of Marlborough. Still further to the left we have Bishop Berkeley, the metaphysician and disciple of Tar-water, and Rooke to whom we owe the possession of Gibraltar. There have yet to be named on the extreme right Addison and his intimate friend James Craggs. The group, it may be admitted, is not wholly congruous nor is it designed to be so, but it is sufficiently so to greatly increase its interest. The whole is in excellent light, and the names we have given will well justify a recommendation to sit a quarter of an hour and quietly examine the features of men who, if perhaps none of them in the foremost rank, all contributed their share to mould the character of the age in which they lived.

There are in the National Portrait Gallery two portraits of the Queen of Hearts. One by Miereveldt represents her probably in her most prosperous times and apparently about 35, wearing a large ruff, a much ornamented dress and heavy strings of pearls. The exact age is not given. The other by Honthout is specified as at the age of 46, and shows a refined face chastened by sorrow and disappointment. She is clad in modern low dress and wears but little ornament. Above hang the portraits of two of her daughters, the Electress Sophia, George I.'s mother, and Elizabeth, Princess Palatine, the correspondent of Descartes.

The whole series from Tudor-Stuart to Brunswick is illustrated in a most instructive manner in this collection. We have Mary Queen of Scots and Darnley her husband, James I., their son, and his wife. Next follow their daughter, Elizabeth of Bohemia, with her husband and their daughter, the Electress Sophia, mother of George I. Elizabeth's unfortunate husband, "the Winter King," hangs above his

wife. He has a heavy aspect not unsuited to the hesitancy of character and lack of ambition which he manifested. Their family, brought up as they were in the school of adversity, showed much ability. It included not only Sophia, the Electress, but Prince Rupert who was not alone a dashing soldier but a man of some scientific attainments, and Elizabeth, "the most learned lady in Europe."

There are several portraits of the Queen of Scots in the galleries and in the Sculpture Room. This latter room is, we fear, often missed by visitors. There are busts of both herself and her boy-husband, Darnley. That of the Queen is very pleasing, a short oval face with well-modelled features; that of Darnley is heavy and coarse. It is the only representation of Darnley in the Gallery.

NOTES AND OBSERVATIONS ON NATURAL HISTORY.

The Ichthyosaurus originally a Land Animal.—The ichthyosaurus was a four-footed reptile which had taken to the water and received modifications (loss of feet, &c.), just as the whale is a four-footed mammal which has taken to the water and lost its legs. It brought forth its young alive.

The Fungus an Above-ground Plant, not a mere Flower.—The fungus—mushroom or toadstool—is to be regarded as an above-ground plant rather than merely a flower or spore-bearer. It differs from an ordinary plant chiefly in the shortness of its life. Many flowering plants are annual, and some live much less than a year. The fungus, however, has usually a life of only a few weeks. In proof that it represents the plant, however, we have the following facts. Other fungi sometimes bud out from the stem. The broken and apparently dead stem-stump of one year may bud again the next and produce

fresh fungi. Some fungi last for months and some for years, gradually growing. Some become actually woody.

Nails without Fingers.—Sydney Smith said of his ancestors that they had no arms but sealed their letters with their thumbs. It is literally true of certain animals that they have finger-nails although they have no fingers. In the Manatee and Dugong all the digits are webbed together into a fin, but upon this fin rudimentary nails are produced. In explanation of this we must remember that the nails are modified parts of the skin and are not formed in connection with the bones. Not unfrequently in human malformations nails are formed when the digits are undeveloped.

The Agouti.—The agouti, like the guinea-pig of which it is a relation, is a South American rodent. The upper lip is entire, the ears short, the tail short and naked, and the fore-limbs have five toes, each protected by a hoof-claw. They resemble on the one hand slender-limbed pigs, and on the other small musk-deer. On the hind-limbs they have only three toes. Agoutis run well and can spring like antelopes. They feed on vegetables. They are somewhat solitary in their habits, living alone in their cells, which they leave only in the evening.

The Family of Bats.—It is possible that the Bat family might teach us something in reference to the influence of food on character. One division of it lives wholly on vegetable food, another on insects, and a third wholly on blood. The blood-sucking bat has so small a gullet that little excepting fluid could pass through it, and it does not possess a stomach which could accommodate solid matters. The gullet is continuous with the intestine without any stomach cavity and without any pylorus. There is, however, a curious appendage or diverticulum from the upper (cardiac) end of the stomach which looks like a coil of intestine, but really ends in a *cul de sac.* It resembles the appendix vermiformis but is much longer. This appendix, no doubt, receives the blood for digestion.

The Vampire bats are undoubtedly bloodthirsty animals, but whether in other respects they show any ferocity of character may be in question.

Squirrels' Marriage.—Squirrels pair, and marriage with them lasts for life. They are very attentive to their young and the family remain with the parents until spring, when the young establish themselves independently. It must be remembered, however, that the greater part of the winter is spent in partial hibernation. Squirrels are provident in storing food both for use when they wake in winter and for the early spring when there is but little to be had.

The Hedgehog and Tenrec. An Illustration of Laws of Inheritance.—Amongst the British animals which hibernate the hedgehog stands first, for its sleep is complete and lasts the whole winter. It is of great interest to note, as an instance of family heredity which altered external conditions have not been able to overcome, that the Tenrec and its allies, which are related to the hedgehogs but natives of Madagascar, also spend half the year asleep. It was reported that they slept in summer, but this was a mistake. They begin their sleep, it is true, in June, but this in Madagascar is the beginning of the cooler part of the year. There is, however, never cold sufficient to necessitate hibernation. It is practically summer all the year through.

We have here a most interesting example of the hereditary survival of habit. The tenrec and the hedgehog are no doubt descended from a common stock which had, probably in a cold climate, acquired the habit of hibernation, and in countries so distant and under conditions so dissimilar they have retained it through countless ages. They have also at the same time retained structural peculiarities which substantiate their pedigree.

ON THE EFFECTS OF LIGHTNING.

Formation of Fulgurites.

We have not in the Haslemere Museum any specimen of a Fulgurite, and shall be greatly obliged to any friend who may put us in the way of obtaining one or more. They are educational in high degree, as giving proof of the intense heat which attends the lightning flash, and also affording illustration of the principles which underlie the making of glass A Fulgurite is a conical tube of rough glass made in sand by the passage of lightning downwards into the earth. The following is M. Flammarion's description of them.

"Lightning is truly the most venerable of glass-makers. Long before the most remote peoples of antiquity appeared, whose glass-wares, encrusted with marvellous iridescent tones by the passing of the centuries, are unearthed by scientific excavations, and displayed in national collections; long before man could have learnt to make use of the resources of Nature, lightning, burrowing in the sand, there fashioned tubes of glass that hold the hues of the opal, and are called fulgurites.

"The ancients seem to have known of these fulgurite tubes, but we owe the first precise description and the first specimen of these extraordinary vitrifactions to Hermann, a pastor at Massel, in Silesia. His fulgurite, found in 1711, is in the Dresden Museum. Since this discovery, fulgurites have often been sought for and found. The tubes, contracted at one end and ending in a point, are to be seen in sandy soils. Their diameter varies from 1 to 90 millimetres, and the thickness of their sides from half to 24 millimetres. Vitrified inside, they are covered outside with grains of sand, agglutinated, and apparently rounded, as if they had been subjected to a beginning of fusion. The colour depends upon the nature of the sand in which they have been formed. Where the sand is ferruginous the fulgurite takes a yellowish hue, but if the sand is very clean, it is almost colourless, or even white. As a rule the fulgurites penetrate the ground vertically; nevertheless, they have been found in an oblique position. At times, also, they are sinuous, twisted, or even zig-zag, if they have met with pebbles of considerable size.

"It is not uncommon for the fulgurite tube to divide in two or three branches, each of which gives birth to little lateral branches of 2 or 3 centimetres long, and ending in points."

Sometimes fulgurite-funnels are formed, not in sand, but in

rock. It is stated that in rock, occasionally, a sort of honeycomb condition is produced, rather than single tubes.

The Immediate Concomitants of the Striking of Trees by Lightning.

It is not very often that the opportunity occurs, to good observers, for witnessing the effects of a lightning flash upon a near object, such as a tree. What happens is usually of less than momentary duration, and too startling to permit of accurate realisation. There may also be a dazzling and almost blinding light. We may assume that it is only when the current is received by a very good conductor that it fails to produce detonation and more or less shattering. In the case of trees which contain moisture, the heat must produce steam, by the expansion of which much of the detachment of bark, splitting of wood, &c., is, probably, caused. With this heated steam no doubt a body of luminous vapour becomes visible, and this phenomenon may last much longer than the flash itself. An occurrence of this kind was witnessed a few weeks ago from the gardens of the Haslemere Rectory. A considerable company was assembled at a parish meeting on the lawn one afternoon. The sky became suddenly black with clouds, so that a condition of partial darkness was caused. Suddenly a tree[1] on a hillside opposite was seen to be in a blaze of light. It was thought by some observers that flames spread into adjacent bushes, but in the torrent of rain which instantly followed the whole was immediately extinguished. Subsequent examination showed that there were no bushes near the tree, and that the tree stood almost alone. All who saw the occurrence agree that there was an appearance of a fire and that it was of longer duration than a mere flash. So little conspicuous was the amount of damage done that one or two search parties failed to discover the tree which had been struck. It was not until

[1] This tree stands in a valley on what is known as the Swan Barn Farm, and can be examined by any one. It is an oak measuring eight feet in girth and is placed in the broken-down remains of a hedgerow.

the boughs which had been killed became brown that attention was drawn to it. When it was found, very interesting conditions were revealed. A portion of the bole about midway between the ground and the top is stripped of its bark for a length of about three feet and left bare but not shattered. Communicating with this and passing up to the top of the tree is a bough which has obviously been dead for some time, and through which it may be conjectured that the current passed. The leaves on the branches adjacent to this are dead and brown, but the evidences of damage either by scorching or shattering are not great. There is no further evidence of injury until we come to the bole just below where the largest branches join. Here, on one side, there is a broad strip from which the bark has been torn, exposing the wood beneath. For three or four inches on each side of this rent the bark, although in position, is loose, as proved by tapping it, but on all more distant parts it remains firmly fixed. The rent ends a few inches above the ground and there is no sign of perforation of the latter. The grass and brambles show no traces of scorching. On the opposite side of the tree there is another vertical slit in the bark, not so wide as that just described, but running lower and attended by a somewhat indefinite hole in the earth. The brambles and grass around this are obviously burnt, but not to any wide extent. Thus it may be suspected that the current passed mainly down the wood itself of the bole and only to a small extent between the bole and the bark. The fact that it has broken through the bark on two sides without loosening the latter widely is proof of this. If so, probably a large part of the middle substance of the bole will die and a hollow tree will result. The conditions are exactly parallel to those described at p. 205, as occurring in an oak now standing at Combeswell. Flammarion quotes the following statement:—

"Boussingault witnessed the destruction by lightning of a wild pear tree at Lamperlasch, near Beekelleroun. At the moment of the explosion an enormous column of vapour arose, like smoke coming

out of a chimney when fresh coal has been put on the fire. The lightning flashed in all directions, great branches gave way, and when the vapour cleared off there stood the pear tree, its trunk a dazzling white: the lightning had taken the bark completely off."

Without assuming that a tree struck by lightning is always enveloped in a mass of luminous steam, we may feel certain that it is surrounded by intensely heated air. It is thus that we explain the scorching of adjacent objects. In the instance of an oak struck and killed with lightning, which is the subject of our plate, at p. 17, the adjacent oaks had their branches killed through a wide radius. In the case described last month, on p. 206, three fir-trees, of different species, which stood round the one supposed to have been struck were all quite killed, although there was no reason to suppose that any of them had been struck. In several other instances the writer has seen the boughs of adjacent trees killed apparently by the globe of intensely heated air which surrounded the one which was struck.

On the Short Duration of the Flash and Explosion.

Although it is probably impossible to realise the brevity of the duration of the cause of these heated masses of air, it must be remembered that the heat produced may last longer. Its persistence will no doubt vary with the amount of moisture in the air. It may be that in some cases the death of animals (sheep, &c.) may be caused rather by the heat than by the electric shock itself.

The transitory nature of the lightning flash, and, at the same time, its heat-producing capacity, is illustrated by the statement that it may fail to ignite gunpowder, and yet melt the gun-lock in which it was contained. It is often recorded that it failed to set fire to hay or straw. Of this Flammarion gives the following example:—

"It was at Laplean in Corrège. One day thunder fell on a grange full of hay and straw, and covered with thatch, without setting it on fire. Then it went to the sheepfold and killed seven black sheep, and left the white alone."

It may be suggested, as regards the sheep, that black structures are much better recipients of heat than white ones.

On the Influence of Metallic Conductors.

Metal, and especially copper and iron, are excellent conductors of the electric current. They attract it, and it will leap from other structures to gain them, often tearing or shattering all impediments. Many observers have recorded, with wonder, how it would take the nails out of boots, tear off buttons, and melt watch-cases. Quoting again from M. Flammarion, we have the following:—

"Moreover, lightning seems to have a special predilection for shoes; it seldom respects them, even when it spares the other garments. Sabots, shoes, and even boots are removed, unsewn, unnailed, cut to pieces and thrown far away with extraordinary violence. Very often the discharge penetrates into the human body by the head and leaves it by the feet.

"During a violent storm (June 8, 1868) a workman was passing near the Jardin des Plantes, when he felt a great oppression on his stomach. He was then knocked down roughly by an irresistible force, and deprived of his senses at the moment of his fall. He was picked up and taken home, and on being examined, his body bore no trace of a wound, and he escaped with a fright. But some days after, when he had recovered from the shock, he remembered that he had worn boots at the time of the accident. These had disappeared, the lightning had stolen them from him, though it acted from a distance. The boots were found in the street, and the soles had the nails completely removed, although they were screwed in and the boots were nearly new."

There need be but little mystery as to the detaching of nails and screws. The effect of the electric current would be to raise them, for the moment, to intense heat, and thus burn them loose from their surroundings. At the same time the production of steam around them would tend to eject them and drive them to a distance.

Other instances illustrating the attraction of metal are given in the following narrations, which might be indefinitely multiplied:—

"There is a case of a mug being thus spirited away from a man, who had just been drinking out of it, and deposited undamaged in a courtyard near. A youth of 18, holding up a missal from which he is singing, has it torn out of his hands and destroyed. A whip is whisked out of a rider's hand. Two ladies, quietly knitting, have their knitting-needles stolen. A girl was sitting at her sewing machine, a pair of scissors in her hand; a flash of lightning, and her scissors are gone and she is sitting *on* the sewing machine. A farmer's labourer is carrying a pitchfork on his shoulder; the lightning seizes it, carries it off fifty yards or so, and twists its two prongs into corkscrews."

"In a church at Dancé (Loire), during vespers one day in June, 1866, a flash of lightning killed the priest and all the congregation, knocked over the consecrated objects on the altar, and buried the Host in a heap of *débris*."

The tendency of the lightning flash to strip those whom it strikes is attested by innumerable narrations. In the Museum of the Royal College of Surgeons there is preserved the whole suit of clothes, with also the heavy boots which were worn by a man who was left naked, but not killed, by a flash of lightning. The agent in these performances is, no doubt, steam. In this instance, and probably in most similar ones, the man was very wet when struck. His soaked clothes were the best conductors about him, and the current passed through them instead of through his body. Everywhere between the skin and the clothes steam was produced and by its expansion the garments were blown off. Again quoting from our author, we have :—

"In June, 1903, at Saint Laurent la Gatine, thunder broke over M. Fromentin while he was working a plough drawn by three horses. Lightning killed the leader, and completely undressed M. Fromentin, after burning his hat.

"The same day, at Limoges, a farm servant named Barcelot was struck under an oak. His corpse was completely naked and he had a severe wound on his left side.

"On August 20 of the same year, a violent storm broke over the Isle of Re. A farmer, who was on his way to the station at Finaud, was struck fifty yards from his own house. The lightning removed all his clothes.

"In 1894, the keeper of the Commune of Saint Cyr en Val, near Orleans, was struck while on his rounds; the fluid deprived him of his clothes and removed all the nails from one of his shoes.

"On July 2, 1903, at Aseras, near Nice, during a violent storm, with hailstones 350 grammes in weight, a Mme. Blanc was on her way to meet a servant who was in the fields. She had only taken a few steps when she was struck by lightning and completely undressed. Her body was uninjured, but the poor woman became dumb."

Not only does the steam-expansion theory explain the blowing off of clothes, boots, &c., but it well fits the facts as to transference of objects to a distance. Thus in the instance of the man whose mug was taken from his hand and carried into an adjacent courtyard, we have but to remember that part of the liquid in the mug (probably of metal) would be instantaneously converted into steam. This would prevent the melting of the metal and at the same time, if the mug were strong enough to withstand shattering, project it to any distance. We have but to suppose the existence of moisture near to any good conducting object and it becomes possible for the thing itself to be blown away by steam.[1]

ON PORTRAITS AS ILLUSTRATING CHARACTER AND DESCENT.

We offer the following memoranda respecting well-known personages as a contribution to the study of character and the laws of inheritance. The portraits to which reference is made may most of them be examined in the National Portrait Gallery and many are given in published works. The study of features and of heads in their relation to the tendencies and endowments displayed by the individuals represented is one of great interest and of some importance. The data do not yet exist for any comprehensive treatment of the subject as a

[1] The work of M. Flammarion, from which we have quoted so freely, is an interesting repertory of Thunder and Lightning anecdotes. It has recently been translated into English by Mr. Walter Mostyn, and is well worth reading. The anecdotes are, however, given very loosely, and with but little attempt either at verification or explanation. Not a few of the narratives are open to much doubt and some are incredible. It is published by Chatto and Windus.

whole. In the meanwhile we purpose from time to time to offer a few fragments and invite our readers to pursue the enquiry for themselves and to give us their assistance. A few hints may perhaps be of service to those who would follow out our suggestions.

We ought not to treat individuals as if they were in any degree self-existent or isolated.

Remember that everyone belongs to a family and take into some account his relatives as well as himself.

Remember that parentage is always double, and always take into account both parents.

At the same time, let it be understood that in some cases the inheritance of character may seem to have been almost exclusively from one parent.

Under what is called the law of *Atavism* the inheritance may appear to be more definite from a grandparent than from either parent.

In dealing with historical characters as with modern families always trace the descent back as far as is practicable.

There is a strong family likeness between Mary I. of England and her aunt Joanna, "the mad" Queen of Castile (see Rose's portrait).

The Mother of the excellent St. Louis was a woman of spirit and of a kind heart, whilst his father was feeble, both in body and mind. "He was neither to be noted for vices nor commended for virtues; and his greatest fame consisted in that he was the son of an excellent father, and the father of an excellent son." It is not, however, quite reasonable to speak so very highly of St. Louis' grandfather (Philip Augustus).

Charles VIII., a prince beloved by all (but very imprudent), was the son of Louis XI., a man feared by all and hated by most. His mother was Charlotte of Savoy, "a virtuous and loving wife," according to her wicked husband's admission, and probably an excellent woman. The Lady of Beaujeu

was Charles' elder sister, and daughter of the same parents. She was a woman of high character and great ability. Charles VIII., after many follies, died at the age of 28, from an accident. It is not safe to judge of character at so early an age. Our Henry VIII., had he died as young, would have had as good a reputation.

It is recorded that Charles had an indifferent figure and a very plain face, with bright sparkling eyes. He had some defect in articulation and spoke slowly and with difficulty, but the kindness of his manner and his sprightliness of humour are said to have rendered these defects but little noticed. He reigned fifteen years and died from a blow on the head in passing under a low archway in a dark passage. His three children had all died before him. It is said that two of his attendants died of grief at his funeral.

Elizabeth, Queen of Bohemia, earned the appellation of Queen of Hearts. She was grand-daughter to Mary Queen of Scots, who won a similar title. If she in any degree rivalled her grandmother none of Elizabeth's portraits seem to do her any sort of justice. That engraved for Lodge, is not pleasing. She has a low, square forehead, partly concealed by a straight-cut fringe of hair. Her features have a pinched, melancholy, and almost cunning expression (she was daughter to James I.). The bust is stout and waist large. If there is anything captivating in the expression it is in the mouth. (For notices of more pleasing portraits, see p. 242.)

Oliver Goldsmith, whose portrait is well known, is represented with a full, round forehead and a high head, somewhat like Sir Walter Scott's. It is interesting to note that Blake, who when a boy saw Goldsmith, was struck with admiration of his head, and longed that he might have one like it. It looks like a head on which the hat might turn round (that is, brachycephalic or broad; see p. 11.)

In the life of Margaret of Navarre, by Mary Robinson, we have the following somewhat severe physiognomical judgment

on Francis I.: "There is, I believe, no good portrait of Francis in his manhood. The face so familiar to us is of a later date; a dreadful face, with its sly and carnal look, the long, coarse nose, and full, voluptuous mouth. It seems as if some pressure of blood on the brain weighed down the eyelids over those small and narrow eyes, and inflamed those florid cheeks over which the coarse dark hair falls down. A dreadful face truly; apoplectic, sensual, indifferent and cunning. But from the frequent contemporary representations of the Field of the Cloth of Gold, we can believe that in 1520 the king looked different from this. Still slender, tall and elegant in figure, he rode his horse gracefully and was first in every pastime. His long face with small eyes is not yet swollen and reddened by indulgence and disease. It has, indeed, a gentle, benevolent and royal expression, an air of kind knightliness; and this was the pose which Francis affected. He was to be the Amadis of kings. He was brave to folly; ideally rash in love and in war; he was fantastically honourable. A story in the 'Heptameron' relates how, having discovered in his court a stranger who had conspired to murder him, Francis gave a great hunt, and leading the traitor aside to a lonely glade, he offered to cross swords with him in fair fight, and then sent him pardoned away" (p. 15).

Our readers must judge for themselves whether our authoress' appreciation of Francis' portrait be not somewhat too severe. A good estimation of his character (Dean Kitchin) may be read at p. 557 of vol. ix. of the "Encyclopædia Britannica."

We do not know any face more like that of Milton than John Selden's. The portrait of Selden given in Lodge is the one to which we refer. There was also a great similarity in the character of the two men. Both were singularly honest and unselfish. Both were fearless of consequences in the avowal of their opinions. Both were learned; both wrote most excellent prose; both also wrote good poetry.

If Milton were by far the best poet, there is yet that in some lines from Selden's pen which closely approaches his. Milton had, it must be admitted, the keener perception of beauty, nor did he lag behind in his appreciation of social order and individual freedom. He was the younger man; Selden died, aged 70, in 1654, and Milton, aged 66, in 1574, It is of their portraits when advancing in age that we speak in remarking on the resemblance of Selden to Milton. In earlier life the portrait of Selden is so like that of John Evelyn that it is difficult not to believe them to represent the same man. Unfortunately, we have no portrait of Milton at this age with which to compare it. We may believe that there was much mutual similarity in the three.

It is generally held that Dick Turpin, the famous highwayman, was a fascinating and handsome man. Capt. Twyford, however, in his records of York Castle, where, in April, 1739, Turpin was confined and ultimately hanged, thus describes him: "He was not at all prepossessing, having high, broad cheek-bones, a short visage, the face narrowed towards the chin and much marked by the small-pox." The description suggests that of a Cymric celt.

The celebrated Sir Kenelm Digby was brachycephalic, with full lips. We have a fine portrait of him by Van Dyck. He was the son of the Sir E. Digby who was executed for his share in the Gunpowder Plot. He is described as "a minor Bacon," of universal attainments and great mental activity. He was a friend of Descartes and of Cromwell. He was of great physical strength, of independent mind and manners, and able to make himself very agreeable. Someone said, "If Sir Kenelm fell from the clouds he would be welcomed wherever he chanced to descend." "Yes," it was replied, "but he must not stay more than six weeks." He was four years younger than Cromwell, and lived to be 62.

A prejudice against red hair is of much antiquity. One of Alfred's proverbs runs: "The red man is a rogue; quarrel-

some, a thief, king of mischief." Judas was painted with red hair (but so also was the Virgin Mary). A Latin fable of the fox and goat ends as a moral with the words, "*Monet nos hæc fabula rufos evitare.*" Alfred's antipathy to red hair may have had something to do with its prevalence amongst the Danes, whom Gray terms "the red-haired slayers."

OUR PORTRAIT GALLERY.

The two portraits which were given last month were purposely left without names. As was then explained, this omission had for its object the hope of encouraging a careful examination of features, uninfluenced by knowledge of the individual. We now proceed to offer descriptions of the features in both, with brief comments on what they may be supposed to suggest. In examining the human face, whether living or in a portrait, with a view to recognition of character, it is convenient to do so under the headings of *Expression, Features* and *Accessories.* It might be well, were it practicable, to exclude accessories, since they are not really intrinsic and may be misleading. It is, however, not possible to shut the eyes to the insignia which denote rank, race, or vocation, and it is better carefully to recognise them and consider them apart. Under the head of *Features* we place all that constitutes the framework of the face. They are unalterable excepting as the slow result of time, and are in no sense under the control of their possessor. It is different with *Expression*, for under that term we include the superadded peculiarities of the mobile parts of the countenance. These may to some extent and in practised persons be assumed for the moment, but they are, in a more important aspect, the consequences of the moods which have been in the past more or less habitual to the individual. Thus expression is a personal acquisition and reveals personal character, whilst features are inherited

and reveal only such tendencies as belong to the family or race.

These explanations will, it is hoped, make intelligible the appended schedules, concerning which it is suggested that they may suitably be used in the description of all portraits or faces of living persons.

We take first the portrait which was given as FRONTISPIECE.

Expression.—Alert, vivacious, cheerful, ready to speak and very conscious of intellectual power.

Features.—Face rather long; oval, with moderately pointed chin; forehead broad and high, but receding. The whole effect well balanced and pleasing. Eyes full; nose large, with a prominent bridge and long projecting tip (Jewish rather than Roman); mouth with well-curved and full lips, chin prominent; ears large, set low, with adherent lobules.

Accessories.—An elaborate white neck-tie and hair curled over the ears and tied behind in ribbons suggest some attention to personal appearance.

Resulting Diagnosis.—A man of great intellectual ability and ready use of language. Of about the age of 30. Of Celtic rather than Teutonic descent, and although probably not a Jew, with possibly a remote descent from Semitic stock.[1]

We may add, as a matter of recorded knowledge, that the eyes were very dark and brilliant.

We turn now to Portrait No. 2, that given at p. 226. This is a very different one and we offer the following analysis of it.

Expression.—Thoughtful, serious, with a tinge of intellectual melancholy, suggestive of slowness of speech and absence of passion. Calculated to inspire trust.

Features.—Face rather long, forehead high, but not un-

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[1] This portrait has during the past month been the subject of comment by various intelligent observers who could not name it. Two of the most skilled have independently pronounced the nose Jewish, but the rest of the face not so. Several have suggested that the face is that of one of the prominent actors in the French Revolution. All have agreed that the face is a very fine one and probably that of a distinguished man. Two suggested Cuvier.

usually broad; eyes deeply set with overhanging brows; nose straight, of good size; lips well curved, moderately full; ears small and set high.

Accessories.—A white neck-tie is the only part of the dress to suggest a preacher, the rest indicates only an unassuming English gentleman of the early nineteenth century, well dressed but quite careless of personal adornment.

Diagnosis.—Not improbably of Scandinavian stock. It is a face more likely to be met with in Norway or Denmark than in Germany, and in the eastern counties of England than in Wales or Ireland. A self-contained, somewhat unsocial, very thoughtful man. Not humorous and not ready of speech.[1]

PORTRAIT OF GOETHE.

(The Frontispiece for September.)

OUR Frontispiece was a portrait of Goethe, when a young man. It is not one which is very commonly given and may possibly have escaped recognition by many well accustomed to others. Most of the others represent him when well advanced in life. We selected this because it allows, perhaps better than any other, of the appreciation of his features. As age advances, what we have included under the term expression often overlays and conceals the true lineaments. These are better seen in the young adult face. It is, of course, important to compare the face of youth with those of more advanced years. The portraits of Goethe are very numerous, and although many of them differ at first sight very remarkably from the one which we have selected, careful comparison will,

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[1] Only one to whom this portrait has been shown has ventured any guess as to who is represented, and suggested Faraday. All have agreed that it is a thoughtful but rather melancholy face, but one to inspire trust. It has been thought to be like that of Charles Lamb.

in almost all instances, make the same features obvious. The face is shorter in those of age, as is indeed the general rule.

A most interesting subject of speculation is as to what was Goethe's race-descent. He was born amongst a Teuton population, but that he was exclusively German it is difficult to believe. His mother's name was Textor, and the salient features of her character were by no means those of the German race. Frankfort was a city of old renown and of mixed population. For ages it had been the home of many Jews. If his dark eyes and his arched nose might be allowed to suggest a remote introduction of Semitic blood there was much in his own character to give plausibility to the conjecture. No man had ever a more liberal outlook on the world. He was universal in his sympathies and quite untrammelled by prejudice or narrow patriotism.

As both poet and philosopher, Goethe has been styled "the greatest intellectual power of our age," and he probably deserves the title. He was a philosopher almost from his cradle, and a poet from his early youth. Perhaps no man ever owed less to teachers. Through his whole life he might be said to be self-educated. Both his parents were highly intellectual and his childhood was passed in close association with them and with an only sister who was a year his junior.

He had no tutor or governess, and was never sent to school. His father, who was middle aged, and somewhat austere, is believed to have rather stimulated the boy's inborn appetite for knowledge than attempted much in the way of guiding and developing it. His mother, who was only seventeen years his senior, was lively, sympathetic and keenly sensitive to all forms of beauty and enjoyment. As her son grew up she soon assumed to him the position of an elder sister and devoted companion.

Without doubt Goethe was what he was from inheritance, and owed but little to environment other than that he was left to himself, with every home comfort and with ample

opportunities for study. His genius was inborn and his aptitude for the acquisition of knowledge was natural to him. In these respects his bringing-up presents some parallel with that of Shakespeare. In each instance it becomes therefore of the utmost interest to examine as to the possible sources of the inheritance.

Goethe's parents were both of them of good family, but of neither has anything of importance been recorded. They were natives of Frankfurt. His father was 39 at the time of his birth, and his mother only 17. It is said that Goethe himself, in youth, cherished a fancy that the family was of more distinguished pedigree than was recognised, and was continually searching the portraits of royal personages in the hope of finding his own features. We may take this as evidence that he did not consider his own face exactly like that of those around him. He never, however, ascertained anything, and in the entire absence of recorded facts we are left to judge from his physiognomy and the revelations of character and intellectual tendencies which his works afford.

The many-sidedness of Goethe is the boast of his countrymen. He was not only a wide-famed poet and dramatist, he made most important discoveries in natural science. To him, probably, we owe the first assertion of "the law of unity which presides in the structure of all living bodies." From the recognition of that law results of the utmost importance have ensued.

We may venture, perhaps, in our next number to give a few brief extracts from what has been recorded of Goethe's conversation. For the present we must be content to offer a schedule of his biography arranged on the space-for-time method.

SCHEDULE OF GOETHE'S LIFE.

DATE	AGE	BIOGRAPHY	CONTEMPORARY EVENTS
1749 to 1759	1 to 10	Born at Frankfurt. His father was near 40; his mother not 18. He was not sent to any school.	George II. Frederick the Great Voltaire. Handel. Franklin.
1759 to 1769	10 to 20	A studious home life. Keen zest for study. Went to Leipsic at 16; already a linguist. Three years a student at Leipsic.	Seven Years' War. Battle of Quebec.
1769 to 1779	20 to 30	Entered at Strasburg University to study Law. Wrote "Götz von Berlichingen" and "The Sorrows of Werther," 1774. Visited Switzerland; settled at Weimar, 1775.	George III. Peace of Paris.
1779 to 1789	30 to 40	Residing at Weimar. A Privy Councillor. Travelled in Italy. Wrote "Egmont" and "Iphigenie." Met Schiller.	Louis XVI. (1774). Lessing died, 1781. Rise of Methodism in England.
1789 to 1799	40 to 50	Second visit to Italy. "Faust" and "The Metamorphoses of Plants." Director of the Court Theatre, Weimar. "Wilhelm Meister" and "Hermann and Dorothea."	American Independence. Death of Frederick the Gt. and of Chatham. Storming of the Bastille.
1799 to 1809	50 to 60	Residing at Weimar. Intimate with Schiller. Married 1806. He accompanied the Prussian Army and was present at the Battle of Valmy.	Execution of Louis XVI. (1793). Reign of Terror. Napoleon. Death of Pitt.
1809 to 1819	60 to 70	Residing at Weimar. Investigations on the nature of colour. "Dichtung und Wahrheit."	Retreat from Moscow. Death of Watt.
1819 to 1829	70 to 80	Residing at Weimar. "Wilhelm Meister Wanderjahre." Knight of Grand Cross of Bavaria.	George IV. Death of Napoleon and of Alexander I. of Russia.
1829 to 1832	80 to 83	Died at Weimar, aged 83. (Goethe died a few years before the Accession of Queen Victoria.)	William IV. Louis Phillipe.

Lessing, Goethe's great predecessor, "The Luther of German literature," was exactly twenty years his senior. He died when Goethe was 32.

PORTRAIT OF JOHN FOSTER.

Our second portrait, that given at p. 226, is that of John Foster, sometimes known as the Essayist. He was a man whose works were highly esteemed and largely read, half a century ago, but which have been almost forgotten. He was nominally a Baptist minister, but although he never dissociated himself from that body his opinions differed much from some of those of his friends, and his pulpit success was but very small. He usually preached his congregations to vanishing point. Yet was he one of the most earnest and most thoughtful of men.

His mind although always under the influence of orthodox Christian theology had yet a strong tendency to original modes of realisation. He would examine all minor facts for himself and form his own conclusions respecting everything that he did not regard as sacred truth. He rejected the doctrine of eternal punishment as inconsistent with Divine goodness. Although a Baptist through his whole life he never baptised anyone, and regarded public worship and the Lord's Supper as the only observances of importance.

He was six years younger than his friend Robert Hall. He was constitutionally unfit to excel as a preacher, and Robert Hall said of him that "though his words might be fire within, the moment they left his lips they froze and fell down at his feet."

The success of his Essays was immediate on their publication, and was such as to induce him to give up his charge and devote himself to literature.

Mr. T. F. Henderson in the "Encyclopædia Britannica" writes: "Foster's moral feelings in youth were not only sensitive, but deeply rooted, and constant and steadfast in their influence, being manifested in entire dutifulness to his parents, strong, but not malicious, antipathies, habitual abhorence of cruelty, intense love of the heroic, and a tone of mind whose seriousness was excessive."

" His imagination often exercised on him a tyrannous sway, endowing past or fictitious events with a stronger and more importunate reality than the actual circumstances which surrounded him." . . A partial counteraction to the predominence of this inward life was supplied by his love of natural scenery, but even here his interest was rather in the grand and sublime than in the beautiful, and Nature awakened his strong enthusiasm more frequently than it inspired him with quiet and genial enjoyment.

At the age of 22 he threatened to give up reading novels :—

" I sometimes think I will read no more : so many of them are romantic and so many insipid. Besides, is there any such thing as learning the art on science of *feeling*. I think the person who without reading novels, would not be amiable and worthy, will never become such by reading them."

One of the most interesting sections of his " Life " are the pages devoted to selections from his private diary. This diary was kept in early life, 25 to 30; from it the following are taken. It might be read with much interest in contrast with Amiel's Diary, the one recording the feelings of thoughtful but emotional Frenchmen in the end of the nineteenth century, the other those of meditative Englishmen at the end of the eighteenth.

The following are some brief extracts from the Diary :—

"I desire to be an intellectual painter, and I review Nature's scenery so often to possess myself of colours."

" Youth is not like a new garment which we can keep fresh and fair by wearing sparingly."

" I am not observing, I am only seeing ; for the beam of my eye is not charged with thought."

" This soul shall either govern this body or shall quit it."

" Regret that interesting ideas and feelings are the comets of the mind ; they transit off."

"One of the strongest characteristics of genius is—*the power of lighting its own fire.*"

From a letter at much later date :—

" The cause of religion is but in rather a languid state. It would be happy if the evils of the times were to work a religious effect, but I fear there are no very strong signs of this. By one means or another, however, religion will most certainly make its promised advances,

and bring at last to the wretched human race a most blessed change from the condition they have been in through all ages."

Foster's "Life" has been published in two volumes, and is of much interest to the student of character. His Essays are well known, and so also his discourse on "The Evils of Popular Ignorance." He was a zealous promoter of education at a time when its value was much less widely appreciated than at present. We append a schedule "space-for-time" statement of his uneventful life.

DATE	AGE	BIOGRAPHICAL RECORD	CONTEMPORARY EVENTS
1770 to 1780	1 to 10	Born September 17, at Halifax, Yorks. His parents were middle-aged, and had married late in life. An old-fashioned child.	American Independence.
1780 to 1790	10 to 20	A hard student, but slow. Member of Baptist Church, aged 17.	Frederick the Great died. French Revolution.
1790 to 1800	20 to 30	Left the Baptist College, Bristol, 1792. To Newcastle-on-Tyne and Dublin. At Chichester. To this period his Journal, as published in vol. i. of "Life" belongs.	Wesley died.
1800 to 1810	30 to 40	At Frome, 1804. Essays published, 1806. Married May, 1808, and removed to Bourton-on-the-Water.	Napoleon. Trafalgar. Death of Pitt.
1810 to 1820	40 to 50	Residing at Bourton. Engaged on Reviews, Essays, &c. Five children born.	Retreat from Moscow. Waterloo.
1820 to 1830	50 to 60	Removed to Stapleton. Lectured at Bristol. Essay on Popular Ignorance published. Lectures (in two volumes) published.	James Watt died.
1830 to 1840	60 to 70	He lost his only son in consumption, and subsequently his wife.	Accession of Victoria.
1840 to 1843	70 to 73	Died October 15, 1843.	Penny postage.

SEASONAL NOTES—OCTOBER.

The following are some of the more noteworthy fungi now on view in the Museum Vivarium at Haslemere.

Polyporus sulphureus, the Heartwood Rot.

A wound parasite, which usually gains entrance to a tree through a cut or bruised surface. It attacks the heartwood first, then the sapwood. The diseased wood becomes a reddish-brown colour, and cracks appear, with patches of mycelium within. Perhaps no fungus in its method of attack more clearly demonstrates the need to protect cut surfaces of trees. All that is required is to paint freshly cut surfaces with tar ; a diseased branch should be cut off far behind the point of attack, and the surface washed with a saturated solution of corrosive sublimate prior to smearing it with the tar. It is one of the very few fungi that occur on the yew. There are at present very fine specimens growing from the trunk of a yew at Inval. It also occurs on the great Kiffold Yew. Placed near the above is an oak branch attacked by the mycelium of a small, cup-shaped fungus, known as *Chlorosplenium aeruginosum*. The part attacked has been stained a bright green. The hard heartwood is completely invested but not coloured. The mycelial condition of the fungus is of common occurrence in this district, but the sporophores are uncommon.

The Fly Agaric.

Perhaps the species which attracts more attention than any other is the Fly Agaric (*Amanita muscaria*), one of the noblest of its tribe, resplendent in a scarlet cap, flecked with white warts. The warts are the remains of a volva or sheath, which, in the early state, covered the entire fungus ; this may be easily determined by examining plants in various stages of growth. It always occurs under or in the immediate neighbourhood of birch trees. The cap is usually from four to

eight inches across, but under favourable conditions it attains immense proportions. De Lisle Hay records specimens 3 feet high and 20 inches across the pileus.

The Lurid Boletus.

Boletus luridus—one of the commonest of Boleti. A showy plant with minutely tomentose pileus and vermilion pore openings. Immediately upon being cut or bruised the flesh assumes a blue tint, which fades away within ten minutes, leaving the flesh a dirty yellow.

Spore Dispersal.

We have already alluded to the curious manner in which the spores of the common stinkhorn fungus are dispersed (see p. 112). Another remarkable method of spore dispersal is exhibited by the fungus *Sphaerobolus stellatus*, common in this district on decayed sticks in damp woods, also upon sawdust and old sacking, though often overlooked, as it is not very conspicuous. Before expansion it looks like "little grains of white mustard seed partially covered with a delicate down." It is gregarious, and sometimes occurs in quite large patches. In structure it consists of two layers, a coat and lining, we may call them. The coat is often orange colour, its lining, which is tough, thin, and colourless, forms a cup, in the bottom of which lies the sporangium, a globose brown body containing the spores. At maturity the coat splits half way down into a few pointed divisions or rays. Soon afterwards, the lining is suddenly turned outwards with such force as to shoot out the sporangium like a shot from a catapult. The lining does not leave the coat, being fastened to it at the tips of the rays. Berkeley compared the action to that of a body tossed from a blanket held at the four corners. The sporangium is sticky, and adheres to whatever it may come in contact with during flight. We have lately been much interested in watching the discharges of these vegetable

mortars, having found a patch on a pine branch at Inval. It was brought home and kept moist in a basin with a little water at the bottom.

Other members of the group, known as bird's-nest fungi (to which Sphaerobolus belongs) are probably better known to our readers. They are so called from their cuplike form, the sporangia lying at the bottom of the cup like birds' eggs in a nest. In this case, however, the sporangia are not loose, but are joined to the interior of the cup by an elastic thread. They are washed out in wet weather, and become detached.

The Orange-peel Fungus (*Peziza aurantia*).

We have given it this popular name from its resemblance to a piece of orange-peel lying by the roadside. It is often crowded, sometimes solitary; in the latter case it is usually regular in outline, resembling a small teacup; cœspitose specimens are always smaller. In the district around Haslemere, wherever a new road is made, this fungus appears at its borders the following autumn.

It belongs to the order *Ascomycetes*, in which the spores are contained in little capsules (*asci*), each containing eight spores. The tips of the asci cover the whole of the brightly coloured inner portion (the exterior is paler). The asci may be artificially induced to break up by gently breathing upon the spore-bearing surface, when the spores will burst forth as a little white cloud.

Individuality in Trees.

The idiosyncrasies of trees are an interesting study. In spring some trees will develop their leaves two, or even three weeks earlier than others of the same species growing in close proximity.

In autumn oak trees of the same age, living apparently under precisely similar conditions, will show great diversity in the manner of shedding their leaves. A tree may shed its

leaves normally, whilst its neighbour retains them throughout the winter, though, of course, in a withered state. This phenomenon was briefly alluded to in our first number, accompanied by a plate; it is the more frequently observed in young oaks and very young beeches. We know of one birch which also exhibits this peculiarity.

The Influence of Galls upon the Colour of Leaves.

If we go into a beech coppice and look carefully at the leaves covering the ground we shall observe that the majority are quite brown, but here and there will be seen a leaf with peculiar little bright green patches upon it. Picking it up, we shall find in the centre of each patch a hairy gall looking like a little cocoon about an eighth of an inch long, standing on its end. It is, in fact, a vegetable cocoon, the home of the larva of a small fly, *Hermomyia peligera*. The creature did not construct its own home, it was obligingly made for it by the plant. The deposition of the egg by the parent fly within the tissues of the leaf caused irritation of the cells around it, consequently there was greater attraction of sap to that part, with the natural sequence, abnormal growth.

But not all our green patches will bear the galls, in some cases they will have fallen away, but the scars of detachment will be readily seen. In others serpentine burrows occur instead of galls, the work of leaf-mining grubs. In not a few the larva may be found within.

Exactly the same phenomenon may occasionally be seen in oak leaves; the leaf for the most part being withered and brown, but here and there retaining bright chlorophyll patches. On the lower surface we find the centre of each oasis occupied with the capped spangle gall (*Neuroterus fumipennis*) alluded to on p. 221 of our last issue. Oak leaves, with the galls of *Neuroterus lenticularis*, the common Spangle Gall, on the under surface, usually show brown spots on the upper side early in autumn. Apparently the presence

of the living organism prevents the over-oxidisation of the adjacent cells, and thus keeps them green.

Notes on the Fall of the Leaf.

One of the earliest trees in the South of England to lose its leaves is the lime; they begin to fall early in September. The walnut soon follows, then the horse chestnut, elm, elder, &c., and, last of all, the beech and oak. The exfoliation varies greatly according to seasonal conditions. Given a mild season like the present one, the leaves are retained much later, but with the first frost they will come down very quickly, especially in the case of the walnut (which, by the way, is not a native tree), a large tree in full foliage one day may within two or three days be naked.

The influence of drought upon the fall of the leaf has been well shown during the past month. In some districts beech trees had shed their leaves by the end of the first week in September. The hot summer may have had its influence.

Dr. George Abbott, writing from Tunbridge Wells on September 16, remarks: "The beech trees in this district have shed their leaves already. When I returned home some ten days ago the few I saw with leaves surprised me. Since then it has impressed me more and more. One of the purple variety has none remaining, others have a few green on east and north sides chiefly, and also in the central parts. I put it down to the drought." On September 4, in Shillinglee Park, near Haslemere, the leaves of the chestnut trees and hazel bushes had assumed autumnal tints, and many of the latter had fallen. Scarcely any wild flowers could be found. Six days later we observed that the bracken on our moors was yellow, and that the heath dodder was unusually abundant.

It is of interest to compare these observations with those in our Diary of 1902, a normal summer with a mild autumn, We find no notes upon the fall of the leaf before November 2, when it is recorded: "Beech leaves are falling very rapidly,

those of the hazel are still retained and show but little change in colour, such is also the case with sapling oaks. The bracken is quite yellow." On November 1 of that year fifty-five wild flowers were on view in the Museum Vivarium. In 1902 the heath dodder was not very abundant.

It is on record that in some tropical forests, notably in Brazil, the trees during the dry season are as bare as our elms are in winter.

At the time of writing (September 22), probably not so many leaves are falling as were during the first week of the month. The same with apples, hardly any have fallen during the past week from trees in a garden from which they were continually dropping a fortnight ago. Even the limes have, as yet, lost but a few of their lower leaves. Dr. Anderson observed that after a terrific cyclone in October, 1864, several trees in the Botanic Gardens at Calcutta put forth new leaves, which remained throughout the winter. In the following spring some produced flowers, others failed to do so. What is the cause of the autumnal tints? Clearly over-oxidisation of the leaf tissues. In autumn the vascular system of a deciduous leaf slowly becomes deranged. Though carbonic acid is still absorbed, oxygen is not so freely given off. It accumulates owing to the blocking up of the cells at the base of the leaf stalk. In excess oxygen causes the leaf to become yellow and finally reddish-brown, as is well shown in beech trees. If some of these coloured leaves are steeped in alkali they will temporarily return to the green colour; if immersed too long they become brown, but will again assume the green tint for a time if removed. The autumn colour changes of leaves may also be assisted by chemical substances which the tree has absorbed through its roots.

It must be clearly understood that exfoliation is not an accidental but a vital process. Preparation for the detachment of the leaf has been taking place some months before A layer of brittle corky cells have been slowly forming at the base of the leaf stalk, and another layer of delicate cells

grows downwards in the leaf stalk, and forms a separating layer, a "line of demarcation," through still living tissue. This eventually causes the leaf to be held in position only by the vascular tissue. A slight breeze at once causes the leaf to fall, its own weight is often sufficient to bring about the result, and certainly frost accelerates it. The scar is quickly covered with a corky layer, or sealed with a sticky fluid.

The process of exfoliation may be well observed in the leaves of the horse chestnut and walnut, those of the beech also show it very well. Of course, a microscope is essential.

QUESTIONS FOR ANSWERS.

(*Continued from p.* 116.)

(11) WHO were "Mrs. Morley" and "Mrs. Freeman"?

(12) Some authorities suppose that the book of Job was written by Solomon, or one of his contemporaries. If this were so, what would be its relation in point of time to the Christian era?

(13) The world on which we live is believed to be round, and to be one of several somewhat similar globes, which are arranged in orbits round the sun, and are known as "planets." Give the names which have been bestowed on the other "planets," and state which are larger and which smaller than the earth.

(14) What is the measured distance of the planet earth from the centre of the solar system?

(15) In the language of the zoologist and botanist, what is the meaning of the word "cell"? Is it used in the same sense in which we speak of a "prison cell" or a "hermit's cell"?

(16) Give the meanings of the words lumen, foramen, bulla, verruca, trabecula, when used in Nature-study.

(17) *Problem:* Why have sheep and oxen no biting teeth in the upper jaw?

(18) Which of the four anthropoid apes most nearly resembles man?

(19) Is the giraffe more nearly related to the horse, the stag, or the ox?

(20) Who was the "old Electress Sophia," and what was the great ambition of her later years?

(21) The "Snow King" was killed in battle, and the "Winter King" died soon after he received the intelligence. Name the battle and the two kings.

NOTICES OF BOOKS RECEIVED.

County Histories for School Reading.—We have recently received a copy of Mr. Malden's "School History of Surrey." It is one of the excellent series of county histories now being published by Messrs. Methuen (36, Essex Street, Strand, W.C.), which deserve all praise. It reminds us of the fortunate position of the school children of the present day. In our younger days such books were unknown, and the chapters of the history—archæological and other—of any county were hidden in the Transactions of its Archæological Society. These were always expensive and often difficult to obtain. All this is now changed, and every child may read a succinct account of the county in which he lives for the modest outlay of eighteenpence. The volume before us should find a place in every library and village reading-room in the county. It contains fifty-three illustrations and maps. One of these, a portrait of a Surrey worthy, we are, through the courtesy of the publishers, enabled to reproduce.

We give this portrait of a great Surrey Socialist as an

example of those in the book under notice. On a future occasion we may probably give some biographical details.

Visitors to our Museum may be interested to compare this portrait with a fine engraving in our collection, which represents the same person in prison.

CORRESPONDENCE.

FIBRO-VASCULAR BUNDLES. — A skeleton leaf shows very well what is meant by this expression. The parenchyma and epidermis (outer covering) have been removed, and the fibro-vascular bundles alone remain. The parenchyma is composed of cells not much longer than broad, which present broad surfaces to one another. Pith, and also the soft parts of fruits, are examples of parenchyma.

DARWIN states that *Hypericum crispum* will poison white sheep but leave black ones unhurt. Query, do the black sheep eat it?

An observant farmer reports that the ox-eye daisy is injurious to both sheep and horses. If its flowers be chopped up with hay or straw for horses sore mouths will be caused, with slobbering.

SCHOOLBOY suggests—respecting what we wrote on "leaf-miners," see p. 162—that if a word is wanted to signify that the larvæ which make their burrows in leaves do so in order to feed, it might be well to call them "grub-burrowers."

MR. BENJAMIN HARRISON, of Ightham, writes to us: I venture to copy a note from my diary, September, 1904:—

Swallows' Nests.—The summer of this year being unusually hot and dry, the mud necessary for their nests was very scarce. I was startled one day to find the nests under the eaves of two cottages adjoining my home fallen down, and young birds killed by falling on the pavement. Not unlikely, the lack of cohesiveness caused the bottoms to give way when the young ones began to struggle in the nests. The nests were not rebuilt. Shortly after my attention was drawn, by a workman, to a sycamore tree in a paddock close by. Here a swallow had built its nest in the fork of a branch from main stem. This seems very like reasoning on the part of the birds and a start in a new direction.

VITALITY OF SEEDS.—To the disputed question of the vitality of dried or buried seeds a new contribution has been made by M. Fliche, a French botanist. In the forest of Hane some years ago he was astonished to find large quantities of a plant called cypress-spurge, or wolf's-milk, in blossom. It is a plant well known in Italy, but not indigenous to France. Two years later the plants entirely disappeared. Similarly another growth, in another clearing of the forest, was unearthed, and this in its turn flourished and disappeared. The obvious botanical reason for the disappearance of a plant is that it

is choked in the struggle for life by the existence or overgrowth of other plants better suited to the environment; and that the cypress-spurge, not finding itself able to cope with its surroundings, disappeared.—From *Knowledge*, August, 1906.

A CROYDON correspondent writes: "I was especially interested in your 'Editorial Notes' in the September number of the MUSEUM GAZETTE. Here, in Croydon, with a population of over 200,000, there is no such thing as a museum, our nearest being Forest Hill (L.C.C.), which is in very good hands, and provided with a lot of good material, but too far away for us. What is required is something in the town."

DISTRIBUTION OF HELIX ACUTA.—We are indebted to Mr. R. Welch, of Belfast, for pointing out an error in the paragraph on p. 185 of our last issue. He writes that this species occurs in every maritime county in Ireland; that it does not occur inland in Ulster, but wherever friable and loose gravelly limestone occurs there it is in myriads.

POTATO DISEASE.—Mr. John Chuter writes: "I have read with great interest the article in this month's MUSEUM GAZETTE on the potato blight; the remarks as to some sets being quite sound when dug up is interesting. Whether the presence of the mycelium of the *Phytophthora* is the cause of their not rotting is hard to say, but this year, in my own garden, the non-rotting of the sets has been very marked, quite a large number not having decayed in the usual way, and I find this occurs much more with the whole sets than those that had been cut for planting. I have for some years past noted that where the sets have not rotted the crop is greatly affected, the new tubers being less in quantity and smaller in size. I have consulted with some practical growers as to this, and their observations seem to confirm my own as to the effect it has on the crop.

"I suppose the explanation of this would be that the plant had not received the benefit from the present set it ought to have done and was therefore not in a condition to produce a heavy crop. Have you noticed this?"

COBBETT IN PRISON.

THE

MUSEUM GAZETTE.

No. 7. NOVEMBER, 1906. VOL. I.

EDITORIAL NOTES.

AN institution which has flourished at Horsham for the past twelve years has for its name "The Museum Society." This is an excellent name. It suggests comprehensiveness, and recognises the importance of a central home for the results of observation and research. It would be well if there were "Museum Societies" in all towns and in many villages.

The MUSEUM GAZETTE was not projected with any design on money profit. We do not, however, mind confessing that thus far it threatens to involve a larger loss than is pleasant. We are told that our title is unfortunate, since the public is slow to accept the word MUSEUM in the large and liberal sense in which we employ it. We include under that term all departments of real knowledge, but the public thinks rather of mere collections of beetles, stuffed birds, and fragments of rock. From our readers we receive constantly letters of warm congratulation and thanks, but the names of new subscribers come less freely than we could wish. Will our friends kindly make known as widely as possible amongst their friends that the MUSEUM GAZETTE contains in addition to stores of fact on the most various scientific and natural history subjects, Biographical summaries and Historical memoranda, that it is well illustrated by Portraits; that it affords guidance as to the choice of Food, and that its great

ambition is to give to its readers clearer insight into the laws of life and their practical application to every-day affairs.

A new memoir of William Cobbett, with judiciously selected extracts from his works, would, we think, be very acceptable at the present time. He left much material of an autobiographical kind. A writer in the "Penny Cyclopædia" says of part of this, "His own account of his courtship and marriage is, it may be fairly said, one of the most beautiful moral pictures ever drawn." The same writer, speaking of "The Life and Adventures of Peter Porcupine," published in 1796, says: "This tract contains a most interesting account of his self-education, carried on, under circumstances of difficulty, with an ardour and steadiness of purpose that have never been surpassed." The work, apart from its personal interest, would afford valuable illustration of the progress of socialist thought in reference to many doctrines now much nearer acceptance. Will Mr. Lucas, whose "Life of Lamb" has given us all so much pleasure, take the suggestion in hand?

It is reported in one of the records of Goethe's conversations that he used the expression, "Man was the first dialogue between God and Nature." To some, such a statement may appear meaningless, whilst to others it may seem full of the deepest insight. What is meant is—if we may express it baldly—that the inanimate earth, the vegetable world, and even the long succession of animal forms, had failed to realise any spiritual existence, and that with man came the first perception of the higher life and of moral good. Man, representing in himself all Nature, began to hold spiritual intercourse with the Author of all Nature, the great mysterious Source of Life. The same sentiment has been expressed by divines, philosophers, and poets, in all ages and in countless forms of phraseology, but never probably with the forcible conciseness of Goethe's words.

In the attempt to estimate character by the face we probably rely but little on knowledge of principles and chiefly on experience. We have learned to associate certain features, and certain expressions of the features, with certain tendencies of character. To the stranger who sat for the portrait we impute the character which we have observed in connection with the features presented by him. We but seldom stop to note the form of his mouth or nose, or the fulness or otherwise of his eyes, but rather take in the whole face at a glance, and declare it pleasing or disagreeable without more ado. In not a few instances we probably quite unconsciously detect a resemblance to some individual whom we have known, and, still unconsciously, impute the known character of our acquaintance to the new-comer.

In reference to this unavoidable habit it would be well worth while to make a collection of remarkable resemblances, and ask how far these have been borne out. It once happened to the writer to be struck with the similarity of the features of a gentleman, whom he met for the first time, to those of Shakespeare. After suitable preface he asked his companion whether he knew what there was of interest in his face. The reply was, "Oh! if you mean that, my friends call me the Divine William." It came out that he had written successful plays. Other instances of coincidence between features and character almost as striking have occurred to us. In the Haslemere Gallery we have a modern portrait which repeats the face of King Henry VIII.

Few subjects are of greater interest in connection with the study of animals than to trace the changes in bodily form, which follow in connection with change in habits and mode of life. Not only do we here observe facts which enable us to realise better the possibilities as to the development of one group of animals from another (evolution), but we have remarkable confirmation of the knowledge supplied from other sources as to the very long periods of time which must have

elapsed. In facetious allusion to doctrines on this head, our contemporary, *Punch*, suggested that a man wishing to acquire wings should stand on his house-top and wave his arms about until the feathers grew, adding, " But it requires much patience." The conversion of a swamp-loving pig into a sea-going whale is almost equally incredible of attainment, but it has been accomplished. We cannot doubt that it has required great patience. It is a most important feature in these marvellous transformations that they have occurred, not in single instances, but in many, and in representatives of different classes of animals.

In the development of the embryo from the egg, much is at first provided which will not in the end be wanted. The subsequent stages are those of suppression of many structures and free growth of others. The suppression is, however, often incomplete and the original rudiment, which failed to grow, may be still recognised in adult life. Thus males have nipples although their breasts as active glands have been almost wholly suppressed ; and the narwhal, which has only the tooth, or tusk, of one side of its upper jaw developed, has the rudimentary tooth of the other side concealed in its socket. Some animals which are hairless when grown up have hair before birth, *e.g.*, Sirenia, whales, &c. Some which are in their youth toothless are not so in their yet earlier stages. This tendency to suppression of certain structures may often be explained in part or wholly by the demands for overgrowth made by some competitor (as in the instance of the narwhal's tusk). This, however, does not explain the whole, for sometimes the suppression occurs without any competition. Thus in albinos there is a failure of the pigment-producing structures, and in some instances this involves the hair and skin-glands as well.

No branch of science, or department of knowledge, can afford to neglect the history of its own development. The

early efforts of its pioneers, their half-informed searchings after light, are often most instructive. The student will often gain a far more impressive estimate of the final results, if he knows something of the steps by which they have been reached, than if, without enquiry, he is satisfied to accept them in their ultimate form. It is under the influence of this belief that we venture to offer to our readers the three extracts from published works which are to follow (see p. 281 *et seq.*). They deal with separate branches of advancing knowledge on three very important topics—Prehistoric Man, Natural Selection and the Development of Mammals—and if they do not speak in the most advanced phraseology of to-day, they yet record in clear language, facts and opinions which were new at the time, and have not as yet been left very far behind.

MAN BEFORE HISTORY.

We commenced the Gazette with a Schedule designed to illustrate what may possibly have been the history of the human race in Britain in long distant times. It comprised a period of a quarter of a million years. We have since on several occasions asked attention to items of evidence which support the conclusions suggested. Amongst those who were prompt to appreciate the facts on this matter, and to yield full conviction to their proofs, was the late very distinguished geologist, Sir Charles Lyell. We extract the following from an able contemporary review of his book. The facts are as interesting now as they were then and will justify renewed citation :—

"The peat-mosses of Denmark furnish a species of evidence which, from being untrammelled by collateral geologic speculation, can be easily appreciated by an ordinary reader. Sir Charles having alluded to the extent and depth of the Danish peat, observes : 'Around the borders of the bogs, and at

various depths in them, lie trunks of trees, especially of the Scotch fir (*Pinus sylvestris*), often three feet in diameter, which must have grown on the margin of the peat-mosses, and frequently fallen into them. This tree is not now, nor has ever been in historical times, a native of the Danish islands, and when introduced there, has not thriven; yet it was evidently indigenous in the human period, for Steenstrup has taken out with his own hands a flint instrument from below a buried trunk of one of these pines. It appears clear that the same Scotch fir was afterwards supplanted by the sessile variety of the common oak, of which many prostrate trunks occur in the peat, at higher levels than the pines; and still higher, the pedunculated variety of the same oak (*Quercus robur*) occurs, with the alder, birch, and hazel. The oak has now, in its turn, been almost superseded in Denmark by the common beech.' The trace of the first race of men—that of the Stone Age—having been found beneath the peat deposit containing the pines, which have never been known to live in Denmark, and which must have taken of themselves centuries to acquire the bulk described above, affords us some idea of the enormous lapse of time which must have intervened between the period of the making of that single flint weapon and the present day. The testimony supplied by the shell mounds of various countries, and the ancient Swiss dwellings, is given at length; and on the subject of *upraised strata* in Sweden and Norway, the information is most copious. In calculating the time required in elevating those deposits of Norway, some of which, containing recent shells, reach a height of 600 feet, Sir Charles writes: 'A mean rate of continuous vertical elevation of two and a half feet in a century would, I conceive, be a high average; yet, even if this be assumed, it would require 24,000 years for parts of the sea-coast of Norway, where the post-tertiary marine strata occur, to attain the height of 600 feet.'"

— —

LAMARCK AND DARWIN.

From the same review which we have quoted we take the following clear exposition of the relative position of the two great speculative naturalists, Lamarck and Darwin. It is hardly necessary to say that more recent investigations, whilst modifying the opinions of both, have welded them together. We now believe in the transmission by inheritance of both accidental and purposeful acquisitions :—

"The author, Sir Charles Lyell, who, be it known, is an advocate of Mr. Darwin's doctrine, gives a brief sketch of the hypothesis first framed by Lamarck. The latter, who may be said to have been the first who openly denied the truth of the theory of the *creation* of species, came to the conclusion that none of the plants and animals which now exist upon the globe were primordially created, but had descended from pre-existing types. This variation he believed to be due to various external causes, such as soil, climate, temperature, &c., and he explained the continuance of the original forms from which the new ones were derived on the supposition that the germs of living things were constantly making their appearance upon the globe. He accounted for modifications of form by saying, that just as some organs become strong and others weak, so may certain portions of the body become obsolete and others attain a superior development. Lamarck did not stop here, but, as our author remarks, 'not satisfied with such legitimate speculations, the French philosopher conceived that, by repeated acts of volition, animals might acquire new organs and attributes; and that in plants, which could not exert a will of their own, certain subtle fluids or organising forces might operate so as to work out analogous effects.' Herein we see that Lamarck went a step too far, and herein lies the great line of distinction between his hypothesis and that originated by Mr. Darwin. There has been an outcry raised against the theory of the latter, on the ground that it was the same as Lamarck's;

but this imputation was cast by good folk who never tried, or were too dull to understand either one hypothesis or the other. Mr. Darwin never supported the theory of spontaneous generation, which was employed by Lamarck, nor did he ever suppose that the variation of a species depended upon the volition of the individual. He simply maintained that new forms rose from pre-existing ones, from the circumstance that, in the ordinary struggle which every animal has for life, those of any brood which had the greatest physical powers (no matter in what direction those powers lay) had the advantage; and that, whilst the weaker members were unable to obtain the conditions necessary to their existence, the stronger were enabled to live, and hence to perpetuate, in intensified form, the peculiar qualities they possessed. Sir Charles Lyell gives the following clear distinction between the two theories: 'Lamarck, when speculating on the origin of the long neck of the giraffe, imagined that quadruped to have stretched himself up, in order to reach the boughs of lofty trees, until by continued efforts and longing to reach higher, he obtained an elongated neck. Mr. Darwin and Mr. Wallace simply suppose that, in a season of scarcity, a longer-necked variety, having the advantage in this respect over most of the herd, as being able to browse on foliage out of their reach, survived them, and transmitted its peculiarity of cervical conformation to its successors.'"

KITCHEN PARKER ON MAMMALIAN DESCENT.

The following passages—which are from the first chapter of the late Professor Kitchen Parker's lectures on Mammalian Descent—may be read in not unsuitable connection with those just given.

"Brief as is the title I have given to the present Course of Lectures, it contains enough in two words to give alarm to cautious and timid minds.

"I need hardly say that no harm is intended by it; and I believe that no harm will happen to the mind of any one who will listen to me whilst I bring forward some of the 'new things' of Biology.

"If in human society the toe of the peasant now and then galls the kibe of the courtier, so in this class the toe of the irrational beast treads, in some cases, very close upon the heel of rational man. It is worthy of remark that this keeper of the mammals — himself a mammal — is, *in size*, a good practical mean between the extremes. On one hand we have 'the smallest monstrous mouse that creeps on floor,' and on the other the unwieldy whale—large as an island. Taking the class as a whole, as to intelligence, we have 'the extremity of both ends'—man at one end, and the frog-witted Duckbill at the other.

"The mammalian class is, indeed, a most motley assemblage, whether we consider their form, their size, or their intelligence, for the wars of time have sadly thinned the ranks of regiment after regiment. Nor is the Darwinian in fault, if, when the roll-call is made, so few are found to respond to it. Let those who clamour for connecting links lay this to heart; myriads upon myriads of mammals have perished in the struggle for life; time has buried them. 'Time, that old clocksetter, that bald sexton, time,' has much to answer for; he has not only thrown the mould over the links of the chain of types, but—to change the image—he has buried thousands of complete family trees, and the geological miner has only unearthed a broken twig here and there.

"He is in a low state of mental development who is unaware of the extreme antiquity of the planet on which we dwell; and it is a far cry backwards to the time when the young of four-footed beasts *first tasted milk*. The group, class, or family—as we may call it—which acquired the peculiar faculty of giving of their very substance to their offspring, is as ancient and as venerable as the group of the reptiles, out of which arose the feathered tribes. Not out of the *stem*, however, of the reptilian family tree, but out of its *root-stock;* and close to that sucker there shot up this other branch, to become the new life-tree of the hairy creatures that give their young ones suck. Two of the first twigs of that new shoot are still represented by the Monotremes, namely, the Duckbill and the Echidna; but, of course, as their line of ancestors must have existed during the formation of the outer half of the earth's ribs, they have had time enough for much specialisation in their structure. Therefore, the scientific imagination, after assuring itself that these living waifs do not lie at the root of mammalian being, bodies forth much lower and more generalised milch-kine than them.

"There are fossil remains, evidently mammalian, from the base of the secondary rocks. Whether these small jaw-bones belonged to Monotremes that had teeth, or to the more ancient Marsupials, does not affect our argument. Mammalian remains will, I feel sure, turn up some day from older rocks; anyhow, in certain strata of the secondary epoch we get various remains of the group above the Monotremes—the Marsupials. Professor Huxley's classification of the mammals is as follows:—

"(1) *Prototheria*, or the Monotremes; examples—Duckbill and Echidna.

"These are the lowest mammals known; they have udders, or milk glands, but no teats, and in many things stand on the same level as the Sauropsida (reptiles and birds).

"(2) *Metatheria*, or the Marsupials; examples—opossum, phalanger, kangaroo. These have, besides the milk glands,

perfect teats, but their young are born so early that they derive no direct nourishment from the mother until they are placed on the teat.

"(3) *Eutheria.*—These forms are the highest, and their young do derive direct nourishment from the mother for a considerable time before birth—before they are nourished by milk. In this group we have *moles* and *men*, and all the forms that lie between these two extremes. I shall speak of the mole as a low Eutherian, of man and of his horse as high Eutheria. There are at present three groups of labourers working at the mammalia, as, indeed, at other types also; these are:—

"(1) The Zoologists. These study the finished form, habits, and distribution of the various types, in the present state of the planet.

"(2) The Palæontologists. These study the fossil remains of the extinct forms, and their *past* distribution.

"(3) The Embryologists. These men are working out the development of this or that type, following it through the various stages of the history of its life."

The author from whom we have taken the above was not only one of the most highly skilled naturalists of his day, but one of the most genial and open-minded of men. He was both reverential and religious, and remained to the end of his life a Wesleyan Methodist. He was accustomed to assert that the idea of evolution was not so new as many seemed to think it, and would clench his argument and shock his friends by remarking that Job showed some perception of it when he wrote, "I said to the worm, thou art my mother." The quotation which we have given is a good specimen of Professor Kitchen Parker's style, at once picturesque in manner and profound in detail.

FRUITS AND SEEDS.

The term "fruit" is applied indiscriminately by a botanist to the succulent plum, the hard seed-pod of a poppy, and the juicy fruit of the strawberry, but it is usually applied in every-day language to those fruits alone which are fleshy and edible. When a flower arrives at maturity, certain of its parts wither and fall away, having fulfilled their destiny. These are usually the petals, stamens and style. The part which remains is the ovary. Hence we may define the fruit as a ripened ovary. The calyx often remains; it constitutes the "nose" of an apple. From what has been just remarked it is evident that the situation and arrangement of the fruit must be the same as that of the flower which preceded it. If the flower was lateral, so will be the fruit; if sessile, the fruit will be sessile, and so on. But slight modifications in position sometimes occur; we may recall the cowslip with its dropping flowers and erect fruit. It may here be remarked that the ovary constitutes but part of the mature perfect pistil, the central organ of a flower. The pistil is bottle-shaped, the style forming the neck; the stigma, the cork, and the ovary, the swollen body of the "bottle." Within the ovary are the ovules, which ultimately become seeds. The "wall" of the fruit enclosing the ripe seed or seeds is known as the pericarp. It varies greatly in different fruits. It may be of uniform structure, and either woody or succulent, as the case may be. In many cases the texture undergoes considerable alterations, and the terms "endocarp" and "epicarp" may be conveniently applied to the distinctive inner and outer layers. A modification of special advantage to the plant is that the fleshy epicarp often with a brightly coloured external "skin" attracts birds, whilst the hard inner layer protects the seed from them.

We may arrange all fruits under two groups, those which open and scatter their seeds, and those which do not open.

As instances of the former we may mention the wild geraniums, and all members of the pea and bean family (*Leguminosæ*); of the latter, the six well-known winter fruits, viz., the "hips" of the wild rose, the "haws" of the hawthorn, and the "berries" of the privet, ivy, holly, and mistletoe. With fruits which open and scatter their seeds we are little concerned in these notes. We may conveniently arrange the others under five heads:—

(1) *The Achene, e.g.*, the dry, single-seeded fruit of each floret of the dandelion, and the numerous achenes of the buttercup.

(2) *The Drupe.*—Stone fruits with three coverings—the skin, the fleshy part, and the "stone" containing the seed.

(3) *The Nut, e.g.*, the hazel (single-seeded). We may specially allude to the Brazil nut, to correct the popular notion that these nuts grow upon the tree in the manner in which they are bought in shops. A large number of the nuts are contained in a very hard case, sometimes as large as a child's head. Humboldt has observed that nothing conveys a more forcible idea of the luxuriant plant-life of the Tropics than these enormous woody pericarps. A specimen transversely divided to show the nuts within should find a place in the botanical section of all educational museums.

(4) *The Apple.*—The "core" is a membranous endocarp; the five carpels of the pistil are buried in the very fleshy receptacle.

(5) *The Berry.*—Besides the wild berries mentioned above, we may take as types the oranges, melons, grapes and currants of commerce. The pericarp, at first thick and fleshy, when fully ripe is soft and sweet, the seeds, "pips," being imbedded in the pulp.

The dispersal of fruits and seeds may be effected in four ways: by the plant itself, by water, by air, and by animals. Our autumn berries are usually dispersed by birds, the brilliant colours of some of them proving irresistibly alluring. Thrushes seem to have a predilection for holly berries and

rose hips. They pluck them from the trees and bushes and carry them away to eat, and thus disperse the seeds over a large area. If the seed is enclosed in a hard smooth case (as in the holly berry), it is eaten by the bird, the case being hard enough to protect it from injury by the gastric juices. Failing a sufficiently hard covering the seed may be protected from swallowing by a hairy covering, which unpleasantly irritates the mouth of the bird. Rose-carpels are an example of this. In cherries, plums, and other stone-fruit, the large stones are not eaten by the birds.

Holly berries are so attractive to thrushes that the bushes are usually denuded of the scarlet dainty long before the advent of severe weather; it is the same with those of the mountain ash, and other brightly coloured berries. This early dispersal is doubtless beneficial, and ensures the production of a vigorous seedling, but it is disastrous to the birds if the frost is prolonged.

Prevalence of Seeds.—It is noticeable that one kind of berry or seed (sometimes two or three) occurs more abundantly than any other.

In 1902 holly berries were remarkably abundant in this district. In the spring of 1904 the ash flowered in profusion throughout the south of England; the abundance of the "keys" in the following autumn was the subject of much comment. We are not aware that the phenomenal flowering attracted much attention, it is probable the flowers were quite overlooked by the casual observer. In the same year the wych elm flowered very profusely.

Last year beech and hazel nuts were especially abundant. This season there was again a good crop of nuts, though perhaps not so many as last, and certainly the parasite is more common. (With us the maggot of the nut weevil was unusually numerous in 1903.) But the mountain ash is the tree which has excelled all others this year in the production of seeds. The gorgeous clusters of berries festooned every tree and bush, but the greedy and improvident birds have by this time eaten them all.

Holly berries are also abundant, but as they are yet quite green (September 22), the fact is not apparent to many. There were but few acorns last year, there are many now, and on both varieties of the oak. Finally, all our sycamores are now laden with seeds.

The causes determining the extraordinary prevalence of seeds on certain trees in certain years are probably meteorological ones.

NOTES ON MIGRATION IN GENERAL.

It may be taken for granted that hunger is the primary cause of the roaming of all animals; it explains the regular migration of certain birds between countries far separated, as well as the localised migrations of the Alpine hare and the North American deer. Dr. Robert Brown observes that "just as in hibernation there is every gradation between ordinary sleep and the long-continued dormancy so designated, so it is possible to trace numerous steps connecting the ordinary roaming about of an animal in search of food with the persistent flight or march in one definite direction at a date so determinate that it may be reckoned upon to within a few days."

Mammals are naturally less migratory than birds, their movements being hindered by the ocean. But the same law governs the movements of those that display the migratory instinct, they move northwards in spring and south in autumn. The reindeer and Arctic fox are the most pronounced migrants amongst mammals. Of irregular migrants, the Norwegian lemming is the best known. Mr. Duppa Crotch, who made a careful study of its migrations, considered that the southward movements of this mammal are stimulated by an instinct to reach land long since submerged in the Atlantic. He writes (alluding to swallows): "It appears

quite as probable that the impetus of migration towards this lost continent should be retained as that a dog should turn round before lying down on a rug, merely because his ancestors found it necessary thus to hollow out a couch in the long grass." Other writers, however, discredit the "Atlantis" theory, and hold that diminished food supplies bring about the migration in the case of this little mammal, a view which receives support from the fact that the incursions are never regular, as in the case of the swallow and other migratory birds.

Certain fishes are regular migrants. With them the movements are generally connected with spawning; for example, many members of the herring tribe (*Clupeidæ*) move into shallow, and consequently warmer, water, in spring, prior to depositing their ova.

For the same cause some reptiles and crustaceans migrate, *e.g.*, the violet landcrab of the West Indies, which lives many miles inland, makes an excursion once a year to the sea to deposit its spawn. In this country it has been observed that toads have their favourite breeding-ponds, and probably travel considerable distances to gain them.

Judging from geological evidence, the migration trait with mammals is of very remote origin. The *Camelidæ*, now confined to South America and Asia, are an American group; their remains occur in the Miocene beds of North America, from which region the true camels migrated into Asia, and the llamas into South America.

Amongst invertebrates we find no regular migration on a large scale. The nearest approach to it are the remarkable movements of certain butterflies across the Isthmus of Panama towards the sea in midsummer, many years in succession. Similar flights have been observed in Ceylon. The destination of the insects is not known.

Some geologists maintain that migration existed in the more remote geological periods; for example, Barraude concludes that this trait was established amongst the Trilobites.

NOTES ON THE MIGRATION OF BIRDS.

In Great Britain we see three phases of migration: The *summer residents*, including such birds as the swallow and cuckoo, which arrive in spring from warmer countries to the south, and remain throughout the summer to breed, returning again in the autumn to their former haunts.

(2) The *winter residents*, such birds as the jack-snipe and bean-goose, which arrive in winter from their summer breeding grounds further north. These return to their old haunts in spring.

(3) The *birds of passage*, such birds as the sandpipers, which rest for a short time on our shores during their journey south in autumn.

It is the rule that all birds breed in the colder regions of their migration.

The chief factor determining migration is the necessity of a greater food supply, and next to this comes a change of temperature.

As shown above, the general rule is that birds migrate towards the Equator in autumn, and from it in spring.

One very interesting result of the systematic investigations of the British Bird Migration Committee is the discovery that the courses of migrants often become circular.

How do birds know where to go? They seem to have an extraordinary sense of direction, flying straight to their destination. It is an inherited instinct, and they have lingering memories of landmarks that have long vanished. They cross the Mediterranean by definite routes, either by the islands of the Grecian Archipelago, or across Corsica and Sardinia, or over Gibraltar to Cetua, places that in the geological past were connected by land.

As a rule, the smaller birds keep nearer to the ground, and in most cases many species travel together, but the cuckoo and nightjar, with a few others, are very exclusive birds, and prefer to migrate alone. It is supposed that the birds start at night and feed by day, but this has not been fully confirmed.

Heligoland is the best spot for studying bird migration. It is on the direct route from north to south, as well as from east to west. Dr. Gaetke, the famous ornithologist, says that song thrushes, meadow pipits, and chaffinches, literally teem on the island in autumn, and that skylarks on dark nights pass across in enormous numbers; he records the capture of 15,000 larks on one night alone on the shore, also 3,400 starlings, snipe and blackbirds in nets spread around the panes of the lighthouse. Birds prefer to travel with a wind blowing across their shoulder. It is stated that the little blue-throated warbler can travel from Egypt to Heligoland, a distance of nearly 2,000 miles, in a single night! The American golden plover is said to fly at the rate of 212 miles per hour. These figures may be over-estimated, but it is certain that migrating birds fly with such swiftness that they break the glass—sometimes $\frac{3}{8}$ inch thick—of the lighthouses against which they strike.

The mortality must be very great, and probably only a small proportion of the vast army of birds which leave this country every autumn ever return in the spring.

ON THE PRESERVATION OF EGGS.

Just as we all of us use processes of syllogistic reasoning, although most of us know nothing of the term, so in household life we often find practices which might have been based on sound knowledge of the laws of life, adopted by those who never heard of biology. Some of these might not improbably be improved were the science upon which they are unwittingly based better studied; and, on the other hand, by observing the results which have been obtained by rule of thumb, the student of natural law may often gain useful hints of further knowledge. The best means for securing the retention of life and the prevention of decomposition in the ova of the domestic fowl is a matter of the utmost importance in its social and

economic aspects, and it also presents to the biologist many very interesting problems. In proposing to devote a series of short papers to the Preservation of Eggs, we shall regard the subject from both points of view. Beginning at what may perhaps seem to some the wrong end, we offer first the following paper, which has been written for us by a gentleman whose occupation has made him practically familiar with the subject under consideration. It may be followed by others dealing with more scientific aspects.

Notes on the Preservation of Eggs.

The methods most usually adopted are :—

(1) Pickling in a brine solution containing also lime.

(2) Pickling in a solution of waterglass.

(3) Cold storing in the shell at a temperature of from 33° to 35° F.

(4) Freezing in the liquid condition.

To be successful in pickling with brine and lime, unslacked lime is placed into boiled water, and as much salt added as will make a solution in which an egg will gradually fall to the bottom of the vessel. If the brine is too strong the egg will float. Sufficient lime should be in the solution to form a thick sediment at the bottom. When this solution is absolutely cold, the eggs may be placed in, and treated in this way will keep from six to eight months satisfactorily. Very great care, however, must be taken that the eggs are free from all cracks or thin places in the shell, and that they are absolutely fresh when placed into pickle.

To eliminate all cracked eggs, it is necessary to examine them in a dark room with a candle or electric light behind the egg, when a crack is easily seen or any dark spot in the egg indicating the commencement of decomposition.

An egg pickled in this way gradually attains a taste of lime, and is not pleasant for use except when mixed with other things, after it has been in pickle, say, two or three months. This flavour appears, however, to depend largely upon the age of the egg at the time of pickling. If the egg is absolutely fresh, say new laid, it appears to contract the flavour much more slowly, and can be boiled and eaten several months after pickling without an unpleasant flavour being noticed.

The waterglass method is one recently adopted very generally for household purposes. It has the advantage of extreme simplicity in the preparation of the pickle, and if the egg is really fresh when put in, it will keep very satisfactorily for six or eight months. If, however,

the egg be at all stale, this method does not appear to have the same power of protecting it against further decomposition as the lime method.

With any egg which has been pickled either by lime or waterglass, it is necessary to pierce the shell with a needle or some fine instrument before boiling, or the egg will burst when it becomes hot.

The process of cold storing or cool storing eggs was very largely attempted several years ago, and has resulted in considerable loss to some who engaged in it. The eggs were repacked in special cases with specially dried and cleansed packing material, either wood, wool, or straw, and then placed in a cold store and kept some two or three degrees above freezing. Should the egg be actually frozen it will burst and be useless, but the effect of the cool storing hindered the development of decomposition, and in some instances the eggs were kept some months with satisfactory results. I have had no personal experience of this method, but have understood that commercially it has not been successful. Any eggs which were damaged or stale and became bad affected those around them, and the result very frequently was a large percentage of loss when the eggs were used.

The practice of breaking the eggs in their fresh condition into cans and freezing them is of American origin, Armour and Co., of Chicago, being, I believe, the first to start this process commercially. The egg is broken in the ordinary way, and the white separated from the yolk or mixed, as is desired, and afterwards frozen in cans containing, say, 2 to 4 gallons each in a ordinary refrigerator. Treated in this way the eggs will keep perfectly fresh for an almost unlimited time. In twelve months there appears to be no deterioration, but where the yolks are not broken along with the whites, there is certain tendency to dryness, which in some cases has been troublesome to deal with when the eggs are thawed. This is, however, a matter which experience will largely rectify, and the process of freezing in this way appears to be the one most likely to result in a satisfactory preservation of eggs where cold storage is available.

A large number of eggs from Canada are annually imported into England glycerined, the shell having been annointed or the eggs dipped in the glycerine. This process appears to have some advantages, and the eggs are sold during the early spring months in England in large quantities.

Vaseline has also been tried in the same way, but does not appear to have been so successful. I have no personal knowledge of the methods in which either glycerine or vaseline is employed.

A few years ago a patent was taken out for the preservation of eggs on an entirely different principle. The eggs were placed in corrugated racks, the racks separated from one another in boxes, and the whole box closed by a hinged lid. The boxes were kept in an ordinary warehouse, and were turned over every day. The action

of turning over was supposed to alter the position of the yolk and to hinder the yolk of the egg from adhering to the shell ; decomposition setting in much more rapidly where the yolk adheres to the shell in an ordinary atmosphere. This process, while having some good in it, has not, I believe, been commercially successful, and I have not heard of its being adopted anywhere except by the patentee.

Eggs have also been preserved in powdered peat dust, and in this way kept for considerable periods. Experiments made, however, with ground peat for this purpose proved, with me, quite unsuccessful.

This year very large quantities of eggs have been broken and stored in a liquid condition. Sometimes the setters say "with 1 per cent. of salt," and sometimes with a "small percentage of boric acid." In other instances they declare that they are prepared "by a patented process."

I have tried samples of a considerable number of brands of such eggs but have always found them very weak, the whites having become watery. Frequently the setters request that a small quantity of bicarbonate of soda shall be added to the eggs before use. This to some extent helps them, but I have never found that liquid eggs are economical or satisfactory in use. They are, I believe, usually prepared from stale goods which, owing to a sudden glut or altered weather conditions, cannot be sold before they would go bad, and have thus to be broken and kept in liquid condition by the addition of chemicals. This material is often named "melange," and is, I believe, used in some cases for other than food purposes.

Egg albumin is prepared in considerable quantities on the Continent, and sold at very varying prices. Desiccated yolk and mixed white and yolk are also regular articles of commerce, but the results in use—whether from adulteration or some change taking place in the preparation—are not altogether satisfactory.

E. H.

JOHN FOSTER'S ACCOUNT OF A PREHISTORIC DISCOVERY.

THE following is taken from one of the Essayist's letters. It was addressed to his mother, and written in 1816:—

"Though nothing unusual has taken place within our walls, a field two or three hundred yards from the house has presented to me a very striking spectacle. In digging for gravel there have been found in different situations a number of human skeletons. I have seen as many as four of them uncovered. One of them was within a rude structure of stones, placed somewhat in the form of a coffin. Another seemed to have been in some kind of coffin of wood, as there were several very large iron nails, and an extremely small bit of decayed wood. About the others there were no stones nor relics of wood. They were in each instance complete, there being very little decay. excepting that the bones, of course, were in a state of separation from one another, and that the skulls were too brittle to be taken up perfectly whole. The teeth were in as perfect preservation as when the bodies were deposited. One set was remarkably fine, and being but little worn, indicated that the person was young, though of full growth, In another instance, a considerable number had been lost before the person's death, and the remainder were so much worn down as to indicate a person of very considerable age. The stature or other dimensions did not appear to be materially different from the present state of the race. There were no coins, weapons, or other circumstances to assist curiosity in the enquiry after the dates of their interment. The most natural conjecture is that they might be Romans, as they were very near the mound of a large Roman camp, as it is judged to be. Other skeletons have at various times been found in these fields. One circumstance with respect to those just now found would seem to indicate that they were people of pagan times; they were placed mostly in a direction north and south; whereas the Popish Christianity, had it been then in the country, would undoubtedly have prescribed most authoritatively that they should have been laid east and west. It may therefore be fairly conjectured that they have lain quiet and unknown in these beds of dust much more, at any rate, than a thousand years. In those beds, though now in a broken and dislocated state, they are again deposited, excepting some fragments that I and Dr. S. took away, consisting of several jaws and portions of skulls.

"I have been extremely struck and interested by these spectacles, which I was glad to have an opportunity of seeing. They have much more power over the imagination than the bones that may sometimes be seen in opening or digging graves in our churchyards. To the

idea of death, and human beings departed, is added, in this case, that of an unknown antiquity, that of the wonderful lengths of time which they have lain unseen and silent under the footsteps of many long generations in succession. The mind is absorbed in musings, enquiries and wonderings who they were, what were their language, religion, habits of life, personal appearance. What kind of people they were that inhabited the place around at that time. There is added the solemn idea, which occurs at the sight of any such spectacles of more modern date, that somewhere there exists at this moment a soul that once inhabited this deserted form."

We quote the above, partly on account of its own interest and partly as illustrating the author's ability as an observer and the tendency of his meditative mind. Possibly some of our readers can furnish further details as to the discovery.

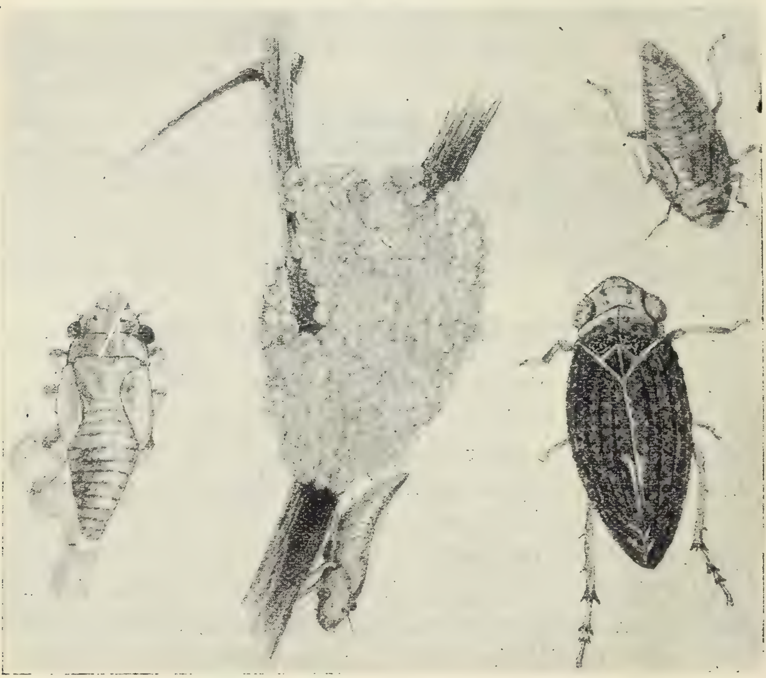
THE CUCKOO-SPIT AND ITS FROG-HOPPER.

The familiar "cuckoo-spit" is the protective habitation of the larva of an insect allied to the aphides and included with them in the order *Homoptera*. The commonest British species is known by the scientific name of *Aphrophora spumaria*. It is more frequently seen in moist summers. It lives a parasitic life on the leaves and stems of plants. The eggs are laid in late autumn, and hatched in the following April. The green larva at once attacks the plant, thrusts in its proboscis and imbibes the sap; pumping it up in great quantities, and blowing it out in the form of small bubbles from its tail end. These bubbles completely cover the insect, which, in this condition, is popularly known as "cuckoo-spit" or "frog-hopper." In a moist atmosphere the secretion is so great as to double in quantity, in one hour, the weight of the insect.

At maturity the larva ceases to make bubbles and the summer heat dries up the spume. The insect, then glued to the twig, splits its pupal skin, and emerges in its perfect or imago state.

The imago resembles the larva in some particulars, but is winged, and of a mottled brown colour instead of green. It does not blow bubbles.

The froth evidently serves the purpose of a bath in which the larva may keep cool.



The Cuckoo-spit, and the Frog-hopper which causes it.
(*From original drawings by the late G. B. Buckton, F.R.S.*)

The larvæ of crickets and grasshoppers live in or upon the ground, and are thus able to obtain necessary moisture. The cuckoo-spit insect has elected to live high up on plants, and must protect itself against summer heat, which desirable end is attained by the process of blowing bubbles with sap.

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THE SEA-OTTER.

Amongst our rarities we have in the Museum the skull of a sea-otter (*Latax lutris*). This animal is a native of the North Pacific Aleutian Islands (Behring Strait), and is of great interest as a connecting link between the common otter and a seal. His skin is very valuable, as he is rapidly diminishing in numbers, and may soon be extinct. The same circumstance gives increased interest to his skull, which presents also some noteworthy features. It is very short, contains fewer teeth than that of the common otter, and its molar teeth are remarkable for being very unlike those of a carnivore. They are broad, massive, and present on their surfaces low tubercles without any approach to the carnassial type. This peculiarity probably has to do with the fact that the animal feeds on fish, clams and crabs, which require to be crunched rather than cut to pieces. They differ widely from those of the seals.

The sea-otter has its hind legs modified, like those of a seal, to form flippers. It is fond of swimming on its back, and is reputed to shade its eyes with one of its fore-paws. It eats its food on its back, and the female will carry her young ones on her chest swimming in that position. Its eye sockets are placed low down in the sides of the skull (the reverse of those of the hippopotamus). The teeth number only thirty-two, there being eight on each side of both jaws. It has only four incisors, whereas the true otter has six. Some seals have six and others only four. In our skull they are beautifully white, and not in the least worn. The animals, although very timid, are sometimes easily clubbed by the native hunters, owing to a habit of hiding the nose in the sea-weed on the rocks, in order to protect them from the wind. They afford an interesting example of peculiarities, both of structure and habit, in connection with long isolation, for they have no near relatives in other parts of the world.

Mr. Lydekker remarks in *Nature*, December, 1904, "that the sea-otter formerly abounded on the coasts of Kamtschatka and the Aleutian Islands, but now stands in imminent jeopardy of extermination unless prompt measures are taken for its protection. . . . At the end of the eighteenth century the annual take was 120,000 in certain newly discovered haunts in Alaska. This number, however, soon fell to 15,000, and when Alaska was ceded to the United States, it had sunk to 700. . . . Of late years £100 is no uncommon price for a sea-otter pelt, while from £200 to £300, and even, it is said, £500, have been paid for unusually fine skins." The fur is of a dark brown colour, fine and rich. Only the under-fur is used, the long hairs being removed. It is the most valuable of all furs, and is chiefly worn in Russia.

HOW THE BEE ORCHIS CONSTRUCTS ITS BEE.

We read in Babington's "Botany" of the bee orchis as follows:—

"(*Ophrys apifera*) lip turned, five lobed, two lower lobes prominent and with a hairy base, two intermediate reflexed truncate, terminal acute, long, reflexed."

Scarcely can even the expert realise that in this jargon is narrated, quite accurately, one of the most astonishing feats of floral achievement. It describes the manner in which the bee orchis has formed its bee. Those familiar with this curious and beautiful flower will know that it exactly resembles the velvety body of a humble bee. At first sight it would be supposed that what looks like the body of the insect consists of a rounded purse or slipper, like that of a calceolaria. Inspection will, however, soon show that it is only an imitation, there is no real purse—that is, there is no real cavity. All is accomplished by folding downwards

and backwards of the borders of the petal, and thus throwing upwards what is to form the back of the insect. The last achievement is to get rid of a long yellow, tail-like appendage which is the lowest part of the flower's lip—in Mr. Babington's language, the terminal. This is made to curl itself up, like a dog's tail between his haunches, until it quite disappears and leaves the lower border rounded and plump. Look under the flower and you will see the whole trick. There is the yellow tail quite concealed from the front view, and there are the two side lobes, "intermediate and truncate," bent backwards under the bee and concealed. It is now as if the whole dog, legs as well as tail, were folded up, and only a rounded back left to be seen. A child might easily with a piece of tissue paper cut out the flower in its first state and then show how the folding is effected. The natural process may be traced in all its steps by looking at young flowers, but unfortunately, only those who live in chalk districts have any chance of obtaining a sufficient number of specimens.

It will be asked with interest, what, after all, is the gain to the flower which rewards the trouble taken in order to make itself look like a bee? One suggestion is that the deception prevents cattle and sheep from eating it, but the weak point in this is, that the rest of the orchis tribe dispense with protection against this risk. A more plausible creed is that for some reason the visits of the real bee are not desirable, and thus the flower makes pretence of being already occupied, much as a too attractive maiden might by possibility put on an engagement ring in order to keep admirers at a distance.

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NATURAL HISTORY NOTES AND EXTRACTS.

Giant Tortoise Fossil in the Fayûm.

Dr. C. W. Andrews, F.R.S., in his "Descriptive Catalogue of the Tertiary Vertebrata of the Fayûm" (recently printed by order of the Trustees of the British Museum), shows that giant land tortoises existed in North Africa at a much earlier date than elsewhere. The fact that tortoises of the pleurodiran section are now confined to the southern hemisphere supports the theory of a former land connection between the continents of Africa and America. "Speaking generally, it appears that (1) probably in Jurassic times Africa and South America formed a continuous land-mass; (2) in the Cretaceous period the sea encroached southwards over this land, forming what is now the South Atlantic. How far this depression had advanced southwards at the end of the secondary period is not clear, but it appears certain that the final separation of the two continents did not take place till Eocene times, and that there may have been a chain of islands between the northern part of Africa and Brazil which persisted even till the Miocene."

A Mole in Captivity.

The following note on a captive mole by Lionel E. Adams, B.A., is taken from the *Manchester Memoirs*, vol. l. (1906), No. 9.

"At noon, on December 15, 1904, I found a mole on the path in Reigate Park. The little beast was wandering aimlessly about without attempting to burrow. I brought him home in one of my leather gloves—not in my pocket, for reasons which previous experience had furnished—and placed him in an empty sugar case with six inches of earth banked up at one end. During the afternoon I noticed him shivering as if with cold, and I provided him with a large handful of hay rolled up to resemble a mole's nest,

placing it on the top of the earth in his box. He soon came upon it, went inside and lay perfectly still; I believe he went to sleep. I fed him with worms at intervals during the evening, and next morning found him active and hearty, hurrying about in search of food. That he had survived the night with only a few worms left was doubtless due to the fact that he was enabled to keep warm in the hay. I do not know whether it has ever occurred to any one to provide a nest for a captive mole, but this is doubtless necessary to sustain the animal's heat, especially when there is no great depth of soil for burrowing; and the constant failures to keep a mole alive in captivity are due to the want of this quite as much as to the alleged lack of sufficient food. Now, I kept this mole for eight days and turned him out at last as hearty and vigorous as when I first caught him, and this without leaving nearly as much food as I have done on previous occasions when the captives succumbed during the night.

"I noticed one day, when the weather was somewhat colder, that he made the nest more compact by pulling in the hay from the inside. On the fourth day he became very restless, so I changed all the earth in the box, as well as the hay. thinking that the dead worms and mice with which I had supplied him had fouled his restricted quarters, though I could detect no offensive odour attending him; but he continued restless till I gave him his liberty on the eighth day of his captivity, placing him in a neighbouring field, where he made many mounds, and I finally lost sight of him when the field was ploughed."

Deviations from Bilateral Symmetry in Crustaceans.

Of six specimens of *Alpheus levis* (a shrimp) in the British Museum, the right claw is larger than the left in four. In the other two the left is very slightly larger than the right. In none are they symmetrical.

In a *Palæmon jamaiciensis* (lobster) the right claw is slightly but definitely, and in all proportions, larger than the left.

In two splendid specimens of the Australian Giant Crab the right claw is very much larger than the left. (*See* Crustacean Department, British Museum, left hand on entering.)

Note on the Growth of Trees.

We quote the following paragraph from some interesting notes upon the exhibits in the Forestry Section at the Nuremberg Exhibition of Bavarian industries, which are given in the October issue of the *Journal of the Board of Agriculture* :—

"A number of cross-sections exhibit the inexplicable condition of things that growth is more rapid on the under side than on the upper side of the branch of a conifer, whereas in the branch of a dicotyledon the opposite is the case. This may be seen by cutting off horizontal branches of the two classes of trees named. In the case of the conifer, the pith will be found to be nearer the upper than the lower side of the section, while in the dicotyledon, the shortest radius is on the under side. The horizontally disposed roots of trees (the spruce is a good example) also show marked eccentric growth, but in their case the character of the eccentricity is always the same, the greatest growth, and therefore the longest radius, being on the upper side. It is evident that the upper side of a root is subjected to less pressure from the soil than the lower side, and as the cambium makes most wood where the pressure is least, the greatest growth is found in a root precisely where it is to be expected. But the variable condition of things in the branches of conifers and dicotyledons has always been a puzzle to botanists, and no satisfactory explanation is yet available. Nor is it quite easy to say why, in a tree grown on a steep hillside, greater growth should be on the side away from the hill."

Larch Trees and Saw-flies.

A species of saw-fly, hitherto not observed in large numbers in this country, has appeared in a larch plantation in Cumberland ; its larvæ have been sufficiently abundant to seriously damage the plantation, which is stated to be a large one. It is the *Nematus erichsonii* of Hartmann, and is of wide distribution in Europe. In this country it has occurred at Glanvilles Wootton, near Esher, Wye, Great Staughton and Budleigh Salterton, but without doing material damage. Hagen has recorded it from the United States. At maturity

the larvæ are about three-quarters of an inch long, and superficially resemble those of the gooseberry and the pine saw-flies. They are dark grey, shining, covered with little black tubercles, and the spiracles appear as brown spots. The head is black and the legs are spotted with black.

Attacked trees may be readily recognised by their more or less leafless condition. A strict look-out should everywhere be kept for this pest. It may be checked by collecting and burning the surface covering of the ground beneath the damaged trees, for it is amongst the moss and leaves underneath such trees that the cocoons occur.

OUR PORTRAIT GALLERY.

The two portraits which we gave last month without names were those of Albrecht Dürer (frontispiece) and William Cobbett (p. 274). We will deal first with the former.

Portrait of Albrecht Dürer as a Young Man.

This portrait is referred to as follows by Dr. Kugler in his "History of Painting."

"Several of Dürer's pictures of the year 1500 are known to us. The first and most important is his own portrait in the Munich Gallery, which represents him in a front view with his hand laid on the fur trimming of his robe. There is a considerable difference between this and the Florence portrait, although the artist (and sitter) is here but two years older—a difference from which we may infer that a remarkable crisis had taken place in the development of his mind. In the Florence picture he is a good-natured, harmless youth; in that in Munich he has suddenly ripened into manhood; his features have become full and powerful, they have gained the expression of a formed character; the forehead and eyes

give evidence of an earnest and deep, thinking spirit." It is to be remembered that in the interval between these two portraits Dürer had married and settled to work in Nuremberg.

The portrait may be analysed as follows :—

Expression.—Grave, thoughtful and reserved.

Features.—The face is long, and the lower jaw being wide it makes some approach to oblong. The forehead is both high and broad, the nose large, with probably an approach to the Roman type, the lips rather full but the mouth not wide, chin broad but not prominent. A very liberal growth of hair on the head but only a poor beard.

Accessories.—A rich fur robe coincides with elaborately arranged flowing hair to denote careful attention to personal appearance and full consciousness of manly beauty.

Resulting Diagnosis.—A man of powerful character, endowed with artistic perception of the beautiful when associated with strength. There is no clue to nationality or race, but it is by no means a characteristically German face. A remote relationship to either Italian or Semitic ancestors is suggested. It is of interest to note that this portrait was in some sense a diploma one. It was sent home when he was residing abroad and it is reputed to have won for him his bride. It will remind many of some of the portraits in which artists have endeavoured to represent Christ. The resemblance is, however, superficial rather than intrinsic, but it is still greater in the original than in our copy.

There are many other portraits of Dürer, most of them representing him in much more advanced life. As is usually the case in age, the face has become shorter.

Those interested in tracing descent will remember that Dürer's father was a Hungarian and will not doubt that in this fact we have a clue to the physiognomy shown in our portrait and to the love of artistic display which is manifested. In another of his juvenile portraits, which is before us, the latter feature is yet more conspicuous in the dress.

SCHEDULE OF THE LIFE AND TIMES OF ALBRECHT DÜRER.

Date	Age	Biography	Contemporary Events
1471 to 1481	1 to 10	A child at Nuremberg, the second of a large family; his father's favourite.	
1481 to 1491	10 to 20	A very diligent boy. Apprenticed to Wohlgemuth, a painter and engraver.	Caxton aged 60. Edward V. Richard III. Martin Luther born. Henry VII. Star Chamber instituted.
1491 to 1501	20 to 30	His *Wanderjahre*, or year of travel. Visited Colmar. Doubtful visit to Venice. Returned to Nuremberg and married merchant's daughter. Earliest "Apocalypse" woodcuts and engravings.	Voyage of Columbus. Maximilian, Emperor of Germany. Savonarola burnt.
1501 to 1511	30 to 40	Famous engraving of "Adam and Eve." Year 1505 spent in Venice. From 1507 to 1519 Dürer resided in Nuremberg. His fame was at its height. Raphael held himself honoured in exchanging drawings with him; all orders of men, from	John Knox born. Henry VIII.
1511 to 1521	40 to 50	the Emperor Maximilian downwards, delighted to honour him. From Antwerp to Rome his greatness was acknowledged. Visited the Netherlands to be present at Coronation of Charles V.; stayed a year.	Battle of Flodden Field. Wolsey, Cardinal. Field of the Cloth of Gold.
1521 to 1528	50 to 57	Died suddenly on April 16. He had suffered from illness since his visit to the Netherlands.	

Dürer was six years older than Titian, and twelve than Raphael. He was younger than Leonardo da Vinci by thirty years, and than Michael Angelo by seven years. Holbein (1497) was not born till Dürer was 26 years old.

Nuremberg at this time was a flourishing city, the seat of a settled and patriotic government, favoured by the Emperors, and enjoying much commerce; it was on the route between Central Europe and the East through Venice. The name Dürer was probably in the original Thürer, a maker of doors. Dürer's father was, however, a goldsmith. Dürer himself was the second of eighteen children. Dürer regarded both his parents with the tenderest reverence and affection, and has left a touching narrative of the deathbed of each. Dürer was his father's favourite son, and was very industrious in youth.

It is to be noted that although born in Nuremberg, Dürer was not by descent, at any rate on one side, a German. His father was a Hungarian who had wandered into Germany.

By the expression "painter," as applied to Dürer's master, we must understand one who produced in great numbers and for business purposes devotional pieces for the decoration of churches and of private houses. Wohlgemuth also executed woodcuts.

Dürer was remarkable for his manly beauty, and it is supposed that his marriage was arranged between his father and the father of his bride during his absence on his travels, he having sent home this portrait of himself.

Agnes Frey, Dürer's wife, survived her husband. They had no children.

Dürer's death occurred very suddenly; so much so that none of his friends could be called to his bedside; it was in the night of April 16, 1528. His health had been failing for some time previously, in consequence of a fever contracted during his visit to Holland. He had visited Holland in order to be present at the coronation of the Emperor Charles V., wishing also to obtain patronage and certain privileges from the Regent, Margaret.

Dürer enjoyed the friendship of many of his celebrated contemporaries. Amongst them were Luther, Erasmus and Emperor Maximilian. He had adopted the Reformed faith.

Luther, in a letter to his friend Eoban Hesse, writes: "As for Dürer, assuredly affection bids us mourn for one who was the best of men, yet you may well hold him happy that he has made so good an end, and that Christ has taken him from the midst of this time of troubles, and from yet greater troubles in store, lest he, that deserves to behold nothing but the best should be compelled to behold the worst; therefore may he rest in peace with his fathers. Amen."

In addition to woodcuts, Dürer engraved on copper, and in the latter part of his life did some etching. He was the author of works on geometry and perspective, and on the proportions of the human figure, and on fortification. He left behind him a diary, which, together with some of his letters, was afterwards published in German. Our own British Museum contains in a large volume (part of Lord Arundel's collection) a very fine series of his original drawings. A still richer one is in the Albertina Palace at Vienna.[1]

[1] We have been indebted for many of the above facts to Sidney Colvin's biography in the "Encyclopædia Britannica."

PORTRAITS OF COBBETT.

We give this month a second portrait of Cobbett, but the following comments apply only to the one at p. 274 of last month's Gazette. The two do not, however, differ materially as to features; our second displays accessories in dress which are not uninstructive (see Frontispiece).

Cobbett's portrait is one not easy of analysis, and his face alone would not have readily lent itself to the caricaturist.

Expression.—Pleasing and genial, with sense of humour, but not without considerable self-satisfaction.

Features.—Face, a rather short oval with rather full cheeks. Forehead rounded, and of good dimensions. Nose average, mouth small, chin rather small and pointed. The whole is symmetrical and well-balanced.

Accessories.—There are none of importance.

Resulting Diagnosis.—A respectable, able and honest Englishman of no very marked character. He might be a country doctor of the last century. Not strikingly like any other known portrait in our memory.

Our National Portrait Gallery does not contain any representation of Cobbett, either picture or engraving.

No one to whom our portrait has been shown has offered any suggestion as to the character of the man whom it represents. "A common but not commonplace face, an able man, but without any special indications of proclivity," has been the usual remark. No one has ventured any guess as to the name. Nor is this vagueness other than what Cobbett's real character might lead us to expect in his face. An intensely human man; taking keen pleasure in life; full alike of sympathy and of prejudice; changeable in opinion, but always certain that he was in the right; loving conflict and controversy, but delighting also in country pleasures and his own fireside.

Cobbett was the son of a small farmer and publican in Surrey, and the grandson of a farm labourer. In the main he educated himself. Observant, keen-witted, and self-reliant; unburdened by superstitions and even deficient in reverence, he apprenticed himself to the world and rapidly accumulated a large fund of experience in the ways and motives of men. A farm labourer, a runaway son, a lawyer's clerk, a soldier, a fortunate husband, and the possessor of most exceptional ability in the use of his pen, he became, at the age of 30, a writer by profession. He lived in stirring times, and political and social topics were those which chiefly absorbed his energies. He found time, however, to write the best book on "Gardening," and by far the best "English Grammar," which had appeared, and which are as yet scarcely surpassed. At the age of 40 he began a weekly periodical which he wrote himself and which was continued regularly until his death, thirty-three years later. But in the interval he had been the defendant in six or seven libel actions, had been fined, and financially ruined repeatedly; and had spent two years in prison. He had commenced the *Weekly Register* as a Tory, but had continued it as a Democrat and Chartist. The circulation of one of his periodicals (there were several) is said to have reached 100,000 copies.

The facts mentioned may serve to show the indomitable energy of the man and his capacity for popular work.

In some respects Cobbett's career and character may be compared with that of Benjamin Franklin. Both were self-educated, observant men, of strong common-sense and remarkable energy. Both were eminently secularist, all celestial sensibility being apparently omitted from their natures. Franklin's organisation was, however, superior to that of Cobbett in his self-restraint, freedom from vanity, reflective capability, and resulting consistency of conduct. It must not be assumed from the fact that Cobbett was often prosecuted for libel and usually convicted that he was always in

SCHEDULE OF THE LIFE AND TIMES OF WM. COBBETT.

Date	Age	Biographical Record	Contemporary Events
1762 to 1772	1 to 10	Born near Farnham, March 9, 1762. He was christened at Farnham, together with two elder brothers.	George III. reigning. Trial of Wilkes. Cook's voyages. Letters of Junius.
1772 to 1782	10 to 20	His father taught him. Engaged in farm work at home. A lawyer's clerk in London 9 months.	American War of Independence began, 1775. The first Sunday School.
1782 to 1792	20 to 30	During 8 years a soldier in Canada, 1784 to 1791. Met his future wife. Discharged, at own request, with thanks for good conduct. Made a charge against officers, and then left for France.	American Independence, 1783. The *Times* newspaper founded, 1780.
1792 to 1802	30 to 40	Went to New York. Was now married. Attack on Dr. Priestley, 1794. "Life and Adventures of Peter Porcupine," 1796. Returned to England from America, 1800. The *Weekly Register* published.	Malthus wrote on Population, 1798. Peace of Amiens, 1802.
1802 to 1812	40 to 50	Became by degrees a democrat. Prosecuted for libel (the Ely case), and sent to prison for two years. (*See frontispiece.*)	Death of Pitt. Luddite riots. Storming of Bastille.
1812 to 1822	50 to 60	Unsuccessful candidate for Parliament. Went to America to avoid creditors, In America. [1817. Returned to England, bringing with him Paine's bones, 1819.	Retreat from Moscow, 1812. Waterloo, 1815. Death of Napoleon, 1821.
1822 to 1832	60 to 70	Delivering lectures. Contested Coventry. Member for Oldham, 1832.	George IV., 1820. Reform Bill, 1830. William IV., 1830.
1832 to 1835	70 to 74	Again returned as member for Oldham, 1834. Died in June, 1835.	

the wrong. Vehemence of language was usually his fault, and although that vehemence was often unpardonable, it was never maliciously directed.

Cobbett's success in life was mainly due to the pains which he had taken in his own education. When he enlisted as a soldier his ability with his pen, supported by his general good conduct, led to his rapid promotion over the heads of others.

The faults of his character were: over-weening self-confidence, love of popularity, precipitancy in the formation of judgment and defective scrupulosity as to the means which might be employed to obtain ends which he believed to be good.

It can scarcely be doubted that during a long series of years "Old Cobbett" was, amongst the working classes of Britain, the best loved man of his day; and the influence which he exerted in fostering many of the opinions which are now uppermost was immense.

We append a space-for-time schedule of Cobbett's life and times, and reluctantly leave a most interesting subject.

GOETHE'S OPINIONS ON EDUCATION AND THE STUDY OF NATURE.

The following extracts are taken from a volume in which Goethe's Boswell recorded notes of conversations :—

"The *results* of philosophy, politics, and religion, ought certainly to be brought home to the people ; but we ought not to attempt to exalt the mass into philosophers, priests, or politicians. It is of no avail ! If Protestants sought to define more clearly what ought to be loved, done, and taught ; if they imposed an inviolable, reverential silence on the mysteries of religion, without compelling any man to assent to dogmas tortured, with afflicting presumption, into a conformity to this or that rule ; if they carefully refrained from degrading it in the eyes of the many by ill-timed ridicule, or from bringing it into danger by indiscreet denial, I should myself be the first to visit the church of my brethren in religion, with sincere heart, and to submit myself with willing edification to the general practical confession of a faith which connected itself so intimately with action."

"Press but ever onward," added Goethe, with fervid animation, "youthful German people, and weary not in your progress on the way we have entered upon! Give yourselves up to no mannerism—to no onesidedness of any kind, under what name soever it finds its way among you. Know that whatever severs us from Nature is false. The path of Nature is that in which you must tread, if you would meet Bacon, Homer, and Shakespeare. On all sides there is much to do. See, but with your own eyes, and hear with your own ears."

"I maintain that some are even born eclectics in philosophy, and when eclecticism proceeds from the inward nature of the man, that, too, is good, and I will never make it a reproach to him. How often do we find men who are, from natural disposition, half stoics and half epicureans! It would not astonish me at all if such men adopted the principles of both systems, and tried, as far as possible, to reconcile them."

"Aye, indeed—if I could but manage to write a work—but I am too old for that—that would make the Germans hate and revile me heartily for the next fifty or hundred years, and say nothing but evil of me from one end of the country to the other—that would delight me inexpressibly!"

"Where knowledge is full and satisfactory, indeed, we stand not in need of faith; but where knowledge falls short, or appears inadequate, we must not contest with faith its rights. As soon as we set out from the principle that knowledge and faith are not given to destroy each other, but to supply each other's deficiencies, we shall come near to an accurate estimate of the right."

(*To be continued.*)

EXHIBITION OF FUNGI AT THE HASLEMERE MUSEUM.

An exhibition of fungi was held throughout October in the Museum Vivarium and was the subject of considerable local interest. Young and old brought specimens for display and identification. An organised fungus foray took place one Saturday afternoon, and was well attended. A gardener brought in one of the largest specimens of the Coral Fungus

(*Sparassis*) that we have as yet seen (see p. 322), and a workman delighted us by bringing, late one evening, in his tool-bag, a fine specimen of the rarer *Sparassis laminosa* (see p. 322).

Some notes on the arrangement of this exhibition may be useful in the future, both to ourselves and to those forming similar collections. It is suggested that such a display should be arranged in all provincial museums during October. The study of fungi is a very important one.

The Vivarium consists of a long shed with asphalt floor, many windows and two doors, and is quite apart from the other museum buildings. Some notes upon its arrangement in summer have been given (p. 56). A shed of this kind serves very well for such exhibitions. No artificial heating is required, and it has the merit of being cheaply erected.

By keeping the windows and the doors open, and putting pans of charcoal on the tables, the strong smell which always emanates from a large collection of fungi was not very pronounced. Of course, the fleshy species—especially the *Boleti* and the members of the genus *Amanita*—were frequently changed. The remarkable fugacity of fungi, collectively considered, and the very short season in which they appear, add a special charm to the study of this group of plants.

All were placed on plates and saucers. Whenever possible, in the case of species growing upon wood, a large piece of the matrix was cut off and placed in a saucer with a little water. The same plan was adopted with some of the *Hygrophori* and other terrestrial species, a piece of the turf on which they grew being carefully cut and placed in a saucer half full of water. Specimens treated in this way kept fresh for a considerable time and young plants attained maturity. The rapidity of growth of one of the Stinkhorn Fungi—or "dead gamekeepers," as we heard them termed by one visitor—was well demonstrated in this way. A plant which burst the volva at midday had grown 3 inches by four o'clock.

Serviceable printed labels for many of the common species

were obtained by cutting up two copies of the "Guide to the Sowerby Models of Fungi" in the department of Botany at the British Museum of Natural History. These guides, which can be obtained at the small outlay of fourpence each, contain some excellent woodcut illustrations.

The diagrams of injurious fungi published by the Board of Agriculture, Worthington Smith's plates of edible and poisonous fungi, and many other coloured illustrations, were placed on the walls. A microscope to demonstrate spores, and several books, such as Massee's "British Fungus Flora," the same author's "European Fungus Flora," and Stevenson's "British Fungi," were placed on a table for the use of visitors.

The shed being roomy, several trestle tables were put up, and in this way it was easy to demonstrate the main principles of classification of fungi, one table (the largest) being reserved for white-spored agarics (*Leucosporæ*), another for agarics with salmon colour or pink spores (*Rhodosporæ*), and so on for the five main groups of agarics. On each of these tables cards showing the spore mass of some typical species were placed. Another table contained the Gastromycetes, the Ascomycetes were kept together on another, whilst a special one was allotted to the Mycetozoa or Slime Fungi.

It was found necessary to impress upon our young friends that in collecting fungi they should not employ the same methods which obtain when making a posy of wild flowers, but always secure the entire plant.

They soon learnt by experience that young plants are in every way preferable to old ones. For reasons stated in our September issue, no special attempt was made to point out the edible species, but the characteristics of the "Death-cup" Fungus (*Amanita phalloides*) and its allies were carefully noted, and comparisons made between young plants of this species and "button" field mushrooms.

Amongst the many interesting species on view during the month, we may mention :—

Amanita muscaria and *mappa.*
Amanitopsis strangulata.
Lepiota rachodes, sistrata and *amianthina.*
Armillaria mellea and *mucida.*
Tricholoma imbricatum, grammopodium, cinerascens, album, spermaticum, sulphureum, saponaceum and *terreum,* with the varieties "*argyraceum*" and "*orirubens.*"
Marasmius androsaceus and *erythropus.*
Collybia radicata, conigena, tuberosa and *extuberans.*
Mycena vitilis, filopes and *pseudopura.*
Russula aeruginea, coerulea and *xerampelina.*
Lactarius controversus, glyciosmus and *deliciosus.*
Laccaria laccata with the variety "*amethystina.*"
Clitocybe flaccida, clavipes and *odora.*
Omphalia umbellifera and the variety "*viridis.*"
Lentinus cochleatus.
Hygrophorus ceraceus, chrysodon, eburneus and *niveus.*
Nyctalis parasitica and *asterophora.*
Panus stypticus.
Entoloma lividum, sericellum and *nidorosum.*
Clitopilus prunulus and *popinalis.*
Claudopus variabilis.
Pholiota squarrosa, Inocybe echinata.
Naucoria escharoides and *erinacea.*
Flammula tricholoma, carbonaria and *sapinea.*
Crepidotus mollis.
Phlegmacium calochrous, largus, and *fulmineus.*
Myxacium collinitus, Inoloma violaceus and *vinosus.*
Dermocybe cinnamomeus and the variety "*semisanguineus.*"
Telamonia armillatus, hinnuleus.
Hydrocybe acutus, subferrugineus, and *illuminus.*
Paxillus involutus and *panuoides.*
Agaricus comptulus and *campestris,* variety "*silvicola.*"
Stropharia aeruginosa and *squamulosa.*
Hypholoma sublateritium and *hydrophilum.*
Chlorospora Eyrei.
Gomphidius roseus and *gracilis.*

Coprinus atramentarius and *picaceus.*

Boletus parasiticus, versipellis, pruinatus, impolitus and *piperatus.*

Polyporus Schweinitzii, lacteus, sulphureus, cæsius, rufescens and *mollis.*

Fomes annosus, fomentarius, and *igniarius.*

Dædalea confragosa.

Trametes Bulliardi and *gibbosa.*

Merulius lacrymans and *tremulosus.*

Hydnum imbricatum and *ferrugineum.*

Craterellus cornucopioides.

Soppittiella sebacea.

Thelephora anthocephala and *laciniata.*

Clavaria cinerea, flaccida, formosa and *pistillaris.*

Sparassis crispa and *laminosa.*

Tremellodon gelatinosum.

Ulocolla foliacea.

Phlebia radiata and *merismoides.*

Mutinus caninus.

Ithyphallus impudicus.

Lycoperdon excipuliforme, gemmatum, echinatum, depressum, and *bovista.*

Sphærobolus stellatus.

Cyathus striatus.

Scleroderma vulgare and *verrucosum.*

Daldinia concentrica.

Bulgaria polymorpha.

Xylaria hypoxylon and *polymorpha.*

Otidea onotica, aurantia and *luteo-nitens.*

Peziza vesiculosa and *badia.*

Neottiella leucoloma.

Dasyscypha virginea and *calycina.*

Lachnea stercorea and *hemispherica.*

Chlorosplenium aeruginosum.

Hypoxylon fuscum and *coccineum.*

Rhytisma acerinum and *salicinum.*

Coryne sarcoides.

Ascobolus purpuraceus and *aerugineus.*

Notes.

Tricholoma terreum is very abundant in the great beech woods on the southern slope of the Downs above Heyshott, in Sussex. It often forms large rings. The varieties *argyraceum* and *orirubens* are not common.

Lactarius controversus occurs in a thicket near Greyswood, and in woods near Marley. Hitherto it has not been recorded for this district.

Lentinus cochleatus is frequent in Verdley Wood, near Midhurst, growing from the base of some of the oldest beeches.

Chlorospora Eyrei.—The most interesting record of the season and the third of this species as far as this country is concerned. It was originally found by the Rev. W. Eyre, in the neighbourhood of Aylesford, Hants, and has occurred in Yorkshire. The only known European agaric with green spores, and very distinctive owing to the almost sky-blue gills. The spores in the mass are, in our opinion, more nearly "greenish-blue" than "bluish-green." Our specimen was found in the beech wood on Heyshott Down, near Midhurst.

Coprinus picaceus was remarkably abundant on October 25 in the great beech wood on Heyshott. In all full-grown specimens the stems were more than 7 inches long, and very incrassated below. The abundant mycelial threads ramified among the leaves and penetrated the ground. In some instances the apex of the stem was bent, as if the weight of the pileus had been too much for it to sustain.

Boletus parasiticus.—This interesting species occurs only in one locality near Shottermill, where it was first found by Mr. John Chuter. Its host, the *Scleroderma vulgare*, is perhaps the commonest fungus of this district. *B. parasiticus* appears in the late summer, chiefly in August. Mr. Chuter says it usually disappears before the last week in September.

Boletus piperatus was widely distributed, though not abundant, in 1901. Since then we have not observed it until this season, when it has been again frequent.

Polyporus Schweinitzii. — This terrible parasite seems to be spreading in this district, a few years ago we knew of but one locality for it; we found it in three this season.

Dædalea confragosa.—We find this species only on the old beech stumps in the woods, on the Downs above Heyshott. For a few hours only at one stage of drying, it smells exactly like stinking fish.

Trametes gibbosa occurs in the same locality as the preceding species. Viewed from above it exactly resembles *Lenzites betulina.*

Clavaria pistillaris.—Very fine specimens may be found under the Heyshott beeches. It has also occurred in Woolmer Forest.

Clavaria formosa.—This elegant species occurs in one spot near the top of Henley Hill, near Midhurst.

Clavaria flaccida.—The plant we have been accustomed to designate by this name is, says Mr. Cotton, who is specially working at this group, not typical. He considers it is Berkeley's *C. spinulosa,* though in the original figure the stem is thicker.

Sparassis crispa.—Known locally as the "coral fungus." Not uncommon in local plantations of conifers, especially Scots pine of fifty years and upwards. The largest specimen we have as yet seen was found about the middle of October on the Lythe Hill Estate. It weighed 5 lbs. 9 ozs., and was 3 ft. 8 ins. in maximum circumference.

Sparassis laminosa.—This species was first recorded for Britain at the time of the British Mycological Society's visit to Woolmer Forest last year. This year we found several plants in Woolmer. Since then a fine specimen was brought to the Museum from Valewood, about a mile from Haslemere. It is abundantly distinct from the above species in possessing large loose laminæ which are never fimbriated at their edges. It is also a stronger smelling and softer plant.

Chlorosplenium aeruginosum.—The pretty little green "cups" of this species are not infrequently met with in this district in

September and October. It was remarkably abundant in a wood near Heyshott Down in October last. Finer specimens we have never seen, some of the ascophores were nearly an inch in diameter.

Otidea aurantia, with us, always occurs on newly made roads. Wherever a new road is made, this plant appears the next autumn.

Inocybe echinata.—We found it late in October in one of the great beech woods around Heyshott Down. Massee wrote of it,[1] "Probably an introduced species in Europe, never occurring in woods, &c., but only in conservatories or botanical gardens."

CORRESPONDENCE.

THE *Sirex gigas* is one of the largest of our native hymenopterous insects. It is yellow and black, with a body about one inch and a quarter long. The female, which is more frequently seen, has a long stout ovipositor, which she uses to pierce the bark of trees and to place her eggs in desirable positions. The possession of this auger has gained her the popular name of "Horn-tail," but both sexes are together usually termed "wood wasp," though the term is not a correct one. The Sirex is more nearly related to the saw-flies than to wasps.

The Sirex is classed amongst our injurious insects. The eggs are laid in Scots pine, spruce and silver fir, sometimes in felled trunks, but more frequently in standing trees that are not in robust condition. The fat white maggots feed in the solid timber. They are full grown in about two months, when they form a silken cocoon at the end of the burrow. The duration of the pupal state seems very uncertain, in some cases it appears to be very lengthy, the perfect insect emerging from timber which had been built into houses a long time previously. Many instances of prolonged metamorphosis in insects are on record :—

Mr. Thomas Markham's interesting "Account of an Insect of the Genus *Buprestis* taken Alive out of Wood composing a Desk which had been Made above Twenty Years," was read before the Linnean

[1] "Monograph of the Genus *Inocybe*, Karsten," *Annals of Botany*, July, 1904.

Society on June 19, 1810. He concludes with remarking upon the presence of *Sirex gigas* in the nursery of a gentleman, "to the no small discomfiture of both nurse and children, in consequence of its size and wasp-like appearance ; a few days afterwards several insects of that species came out of the floor of the same room." This circumstance was related to him by Sir Joseph Banks.

VITALITY IN SEEDS.—Landreth, in the *Proc. Amer. Phil. Soc.*, No. 182, records that a packet of radish seed left in the attic of Fort Conger, 81° 44′ N., by Lieutenant Greely, Commander of the Lady Franklin Bay Expedition in 1883, was discovered by Lieutenant Peary (Commander of the Polar Expedition) in 1899. The seeds were sent home, and sown in the spring of 1905. Though they were then at least twenty-three years old, and for sixteen years had been exposed to a winter temperature of 60° to 70° F. below zero, no less than 50 per cent. of them produced perfectly normal plants.

WELLINGTONIAS STRUCK BY LIGHTNING.—Mr. Bloomfield writes concerning the Wellingtonia that was struck by lightning at Guestling, near Hastings : "The tree was struck near the top, and a narrow strip of bark was raised from near the top almost to the bottom. There was standing close to the tree an iron roller with its long iron handle resting against it. The lightning went down the tree as far as the iron handle and then, I presume, passed through the roller into the earth, for there was no mark beyond the handle. The tree has since looked sickly, as if about to die, but is still alive. I suppose it was struck from six to eight years ago—I do not remember exactly how long."

ENQUIRER.—Your leaves are those of the Western Plane (*Plantanus occidentalis*). We hope you observe the marvellous way in which the new leaf-buds are protected. In most trees they are formed in the angle at the junction of the leaf-stem and the twig, but in the plane the base of the leaf-stalk actually encircles the bud. Upon the fall of the leaf, the buds are protected by a resinous substance, as in the familiar great sticky buds of the horse-chestnut.

CARLYLE'S "LIFE OF COBBETT."—A POSTSCRIPT.

It is due alike to ourselves and the author to acknowledge that Mr. E. J. Carlyle's recently published "William Cobbett" was only brought to our knowledge just before going to press. Had we known of this work, what has been said at p. 278 would have been much modified, or possibly omitted. The *Times* Catalogue says of it : "A clever study of the bustling life and vigorous personality of the impetuous reformer." We have not yet seen it.

Portrait No. IV.
For description and name see next month's Gazette.

Érasme naquit à Roterdam l'an 1469 mourut à Basle en l'an 1536

THE

MUSEUM GAZETTE.

No. 8. DECEMBER, 1906. Vol. I.

EDITORIAL NOTES.

We differ *toto cælo* from those who hold that museums in villages or small towns ought to restrict themselves to local objects. By all means have in all such museums the best collection possible in illustration of what can be got in the district, but let it be a department, not the whole affair. What are called "Local Museums" are difficult to make anything like complete, and the endeavour to make them so may stimulate some of the worst vices of the mere collector. However successful, they remain meagre and unattractive. For educational purposes they cannot approach one of general scope. The curators of such museums are like a wing-maimed bird or a pugilist in shackles. As a rule, we fear that merely local museums rarely attain the dignity of a curator, but languish for a few years under an honorary secretary, who once was zealous, and finally hand over to some more liberally constituted institution the remains of the Herbarium, and a few stuffed birds. It is better to do things well while we are about them.

That an Educational Museum need not neglect local collecting was, we are proud to say, illustrated in the Exhibition of Fungi which was made a month ago at Haslemere. Near upon six hundred specimens were then shown in their fresh state, and duly labelled. Next autumn we hope to repeat the feat. It was attained under the guidance of the Museum

Curator by the energetic help of some ladies, several gardeners and a number of school children.

Special exhibitions ought, we are convinced, to be part of the arrangements at all active museums. They enable a curator to make fivefold use of his space, and thus to bring under notice innumerable objects which would otherwise remain hidden away or unobserved. They go far to obviate the evil of overcrowding. We have had at Haslemere this summer: (1) An exhibition of Samplers and Needlework; (2) one of Fungi; (3) one of Autumn Leaves; (4) one of Portraits illustrating French History. Others are in preparation; of Mosses for the winter; of Portraits illustrating Physiognomy and Biography and other subjects. Keeping one room or suite of rooms for such exhibitions, it might perhaps be found convenient to allow a month for each, and thus keep up a constant change.

Those who do not visit the Exhibition of Jewish Art and Antiquities now open in the Whitechapel Art Gallery, will miss an educational opportunity of much interest. In addition to a large display of important documents, old books and articles of ceremonial worship of especial interest to the Race and the professed Bibliologist, there is much to claim the attention of the more general student. The paintings, perhaps, stand first, for the collection comprises some of Israels' masterpieces. The Student of Physiognomy and of race-character, has a treat in the numerous portraits, many of them excellent. It is impossible to miss the main traits of the Hebrew face, and at the same time to note that in many instances it needs a trained eye to detect them. It is to be hoped that a similar exhibition may be organised at a future time, and that a yet larger collection of portraits may be got together. Not only engravings, but photographs should be displayed.

Bearing upon the question of Goethe's race (see p. 260), we may note that there is a profile portrait of Moses Mendelssohn (the philosopher, not the composer) in the Jewish exhibition,

in the Whitechapel Gallery, which is so like one of Goethe, that the two might be mistaken. It is to be admitted, however, that there are others of Mendelssohn which are not like Goethe, and others of Goethe which do not resemble Mendelssohn. The one to which we refer was No. 722 in the large hall. It is by the Tassaerts, father and son, as artist and engraver. None of the full-face portraits show any striking resemblance between the two men.

In what we have written of Goethe's features we have implied a belief that he was not of wholly German blood, but probably derived part of his genius from an Italian, if not a Semitic strain. The following quotations may be added to those given from contemporary observers.

Gleim writes of Goethe when a young man: "I scarcely know what there was about him which struck me particularly, except *a pair of brilliant black Italian eyes*."

Jung Stilling mentioned "Goethe's broad brow and flashing eye."

An anonymous writer mentions, "His majestic gait and lofty forehead; the noble form of his head; his fiery eye and arched nose."

Descartes' portrait is certainly Jewish. The nose is almost hooked and has a high bridge. The lower lip is large. He was born in Touraine and of a semi-aristocratic family, which made boast that no *mésalliances* had ever occurred. His relatives considered that in devoting himself to philosophy he degraded the family.

Descartes had in the early part of his career great hope of improving the science of health so as to lead to great prolongation of human life. It is recorded of him that later on he regretfully acknowledged that the difficulties had proved greater than he had anticipated, "and that he now felt sure that his ambition to prolong life was not to be accomplished; none the less, he had learned, he tells us, that far more im-

portant lesson that if death must come it need not, at least, be feared."—"Haldane's Life," p. 296.

Goethe may be regarded as the Apostle of self-culture.

In an expression, for which his translators have found no more elegant equivalent than "to cheerfulise existence," Goethe summed up his interest in secular life and its objects. The phrase reminds one of the little boy who was reproved by his mother for wasting his time with playthings: "I'm not wasting time, mamma; I'm making myself cheerful."

Goethe gave to us all a not unimportant warning when he said: "The phrases men are accustomed to repeat incessantly, end by becoming convictions, and ossify the organs of intelligence."

In reference to the formation of a man's character there are two schools of belief. The one attributes almost the whole to the influences under which he has been brought up—his environment as it is called—and very little to inheritance. The other regards the inborn and inherited qualities as by very far the most important. The truth, of course, lies midway. The beautiful parable of the Sower is strictly applicable. It is for heredity to supply the ground and for environment to sow the seed. There are vast tracts growing only luxuriant forest or prairie grass, which would produce wheat if it had been sown, and an endless amount of labour in wheat sowing has proved unproductive on account of the nature of the soil.

We many of us look back upon some friendship or the perusal of some book, or the hearing of some discourse, as having been a turning point in a mental or moral career. Such gratitude is often appropriate and well deserved. It ought not, however, to shut our minds to the full recognition that it was to the faculties derived from some parent or grandparent, or, yet more correctly, from our ancestors taken collectively, that it was made possible for the poem, or the sermon, or the friend's conversation, to affect our final and personal conversion.

ANTICIPATION OF WINTER.

Our earth, in its yearly journey round the sun, has so far reclined on its axis that those of us who reside in its northern part, now see his face for only comparatively short periods during each daily revolution. The labourer can no longer have enough light for his work much after four in the afternoon, and it is useless for him to be up and about much before seven in the morning. With a fairly clear conscience we can now remain in bed till near breakfast time, and if, as all breakfast room windows ought to do, ours open to the east, we may be dazzled at our meal by brilliant rays of light which make straight for our eyes. We had nothing of this trouble in the summer, but now, morning and evening, the sun looks almost horizontally in at our windows. It may in this way glorify pictures hanging on the opposite wall, of which, during three fourths of the year, the beauties have been but half seen. This shortening of our day is not only an evidence of changed conditions, but it is ominous of others, and more serious ones, to come. Nor is it a novelty; the drama has been repeated year by year, millions of times, and all that lives on the earth's surface has accommodated itself to the recurring change. In a sense, the world may be said to expect it. From the most lowly vegetable onward, through the whole animal creation, it is recognised that a cold season will come, and that with it there will be the slowing of all life's energies and a temporary suspension of many of them. The cold may bring with it various concomitants. The surface ground may become hard as rock, the waters solid as glass, and all surface-growth may be buried for weeks in a thick wrapper of snow.

It follows as a natural result of the long recurrence of these changes, that all the various forms of life on the planet

will become adapted to them. The adaptations which have been effected are exceedingly varied in character, and many of them very curious. They have for a common end the enabling of the individual or the species to survive a period of privation due on the one hand to depression of temperature, and on the other to reduced supply of food. It may be of interest to glance briefly at some of these.

We will begin with Vegetables.

A large proportion of our English trees, on the approach of winter, loosen their leaves and let them drop. Thus they avoid the breaking of their branches which would otherwise occur from snow, and are in much less danger of being uprooted by high wind. The riddance of the leaves, the active agents in digestive and other changes, also makes possible the sleep of trees. Hibernation results. The tree remains alive but it does not breathe, and its juices, if they move at all, do so very sluggishly. Now is the time for the new wood to harden, for the sap, no longer attracted upwards by the leaves, can expend its powers in perfecting the summer's work. It is a suggestive fact that the larch, which sheds its leaves and goes to sleep in winter, makes much better wood than the Scotch pine, which keeps them, and in some sense remains awake. It is better to do the right thing at the right time.

Of those trees which in England do not drop their leaves, it is in a general sense true that they do not spread their branches widely. Many of them are conical in form and slope their branches upwards rather than outwards. Others, like the yew or holly, grow slowly, and form very strong wood, and produce very stiff foliage. Others have wood which in flexibility and spring-power approaches whalebone. Thus the cedar is fabled to shake off the snow.

Another large section of the vegetable world comprising representatives of various tribes have adopted the plan of not only losing their foliage, but also their stems, and of dying down to the part protected by the earth. Their roots only, with an attached root stock or bulb, live through the

cold of winter. Others, more timorous still, are content to trust their chance of survival to minute and usually well protected representatives, which, preserving a wholly latent vitality, can under various conditions endure degrees of cold which would have been fatal to their parents. These are the seed-producing annuals.

In the family of Fungals the retirement from air-exposure is often most absolute. The whole plant is lost in the earth, or in some piece of wood or other substance, and not a trace of its existence can be detected until the next season comes round. Other species, emulating the lichens and some mosses, have become able to resist cold, or need only the protection of the friendly snow.

We must of necessity leave aside the innumerable tribes of minute or microscopic fungals for the survival of which by alternation of generations and a multitude of other devices provision is made.

We will turn now to what some will consider a more interesting department, that of Animal life.

As might be expected, the cold-blooded animals, snakes, lizards, toads, frogs, &c., &c., do not suffer serious harm from depressions of temperature, and most of them are capable of long abstinence from food. None of them have any coverings protective against cold, nor do they need such. To them winter has negative losses, but no real hardships. The lizard misses his warm wall and the swarm of flies, but he retires into his favourite crevice and quietly waits for happier days.

Fish can sustain life in any temperature that water can assume, and may possibly even live for a time in solid ice. Their reproductive functions, as a rule, pass into abeyance during winter and they no doubt eat much less, and become more sluggish. In other respects we may suppose that winter makes no great difference to them.

It would take us too long even to allude to the varied and wonderful winter habits of Insects. An enormous number of

them die on the approach of cold. In some tribes, as in bees and wasps, there is a wholesale deliberate massacre. The survivors, as a rule, hibernate, some, as bees, with a provision of food; others, as butterflies, wholly without. The latter creep in protective corners and crevices, and are ready, as all know, to be prematurely roused by a few days of unusual warmth, long before the spring is really established. In the case of many insects, probably only a few representatives survive the winter, but their extraordinary fertility usually supplies the wonted summer population.

It is common to almost all fur- or hair-bearing animals to thicken their coats as winter approaches. A dense undergrowth of soft hair or wool takes place, which is equivalent to an additional flannel jacket. Very curiously, the Goat family, excepting in Arctic regions, appear almost wholly to fail in this provision, whilst their near relatives, Sheep, carry it almost to excess.

Of the whole family of *Birds* it may be said that "dowered with the fatal gift" of wings, no special instincts of winter protection have been developed. With them, migration takes the place of hybernation, and they do not trouble to build either storehouse or barn. Their nests are for nursery purposes only. The consciousness of ability to change place easily in case of inclement times, appears to produce a light-hearted carelessness as to the winter's needs. They waste the autumn's wealth of berries and seeds in the most reckless manner, gaining only as a winter preparation a great accumulation of fat upon their bodies. Yet they are warm blooded, very much so, and they are not able to fast long. The result is, that if a severe winter comes, a great many of our resident birds die. We have used the word migration in a wide sense. A great many birds which are not true migrants, yet change locality on the wing very freely. There are, in fact, only a few—of which, perhaps, the Robin is the best example—which do not do so more or less. These home-stayers frequent the haunts of men in winter, and flock about farmsteads

sheepfolds and the like, and profit by forethought and industry in which they have had no share. They are usually welcome, for their condition for the time being is very pitiable.

Leaving here the improvident Birds, we now proceed to consider in somewhat greater detail the provisions which are made for winter by various Mammals. Our remarks will be restricted to those found in England.

The *Mole's* dwelling place and hunting ground is the very uppermost layer of the earth's crust; the epidermis or scarf-skin of the world. He never burrows deeply, and he seldom comes to the outside. He is an enormous eater, and abhors fasting, which, indeed, is very injurious to his health. He does not, however, seriously fear being frozen-in during winter. Snow is his great friend during long frosts, and he has learned to trust to it. Under a thick coverlet of snow, which may have opportunely fallen just before the frost became severe, the soil will have been kept unhardened, whilst the worms will have been driven down to just the depth which suits his habits. Having selected sites to which he is well accustomed, he has no anxiety as to his Christmas dinner, and would not dream of sleeping past a time so cheerful. The only provision which he makes for winter is to look well after his burrows in autumn, and to open-out new ones where wanted.

The *Otter* is for the water what the mole is for the earth. He does not usually go very deep, and he never seeks his food on the surface. He, too, has learnt by the experience of long ages that even the most terrible winters have their mitigations. Under a thick layer of non-conductive ice, the deeper water will continue to flow, and the fish will still swim in it. It comforts him also to know that however low the temperature may be above the stream, the water will never fall below 32°, and will usually be considerably above it, and thus not too cold for a bracing plunge and swim. With these prospects before him, he neither lays up a store of frozen fish, nor does he risk degradation of his moral sense by going to sleep.

Badgers are possibly half-hybernators. They certainly get up in winter, and the tracks which they make in snow often lead to their discovery and their destruction. Whether they ever store food, and how long they sleep at a time, are questions on which our knowledge is at fault.

Foxes neither sleep nor store. They thicken their under-fur in autumn, and this done, they trustfully hope that all the pheasants will not have been shot nor all the rabbits snared. Unless the weather is very bad they will hardly take to living in their holes, but will prefer to rest wide awake under some thick gorse-bush ready for the joke of leading an army of dogs, horses and men, a toilsome and bootless chase across the roughest fields in the neighbourhood.

The *Weasel* tribe, although proverbially wide awake when awake, are sleepy animals, and no doubt spend all their time, when not hunting, in bed. Summer is their time for frolic, not winter, and their Christmas is probably, after the manner of some Sectaries—kept rather as a fast than a feast. In order, however, to reduce its hardships to a minimum, some of them have adopted the habit of changing their coats and dressing wholly in white during winter, so that when snow is on the ground they may be the better able to steal furtively on the unsuspecting bird or mouse or rabbit. It may be doubted whether in England this habit is worth the trouble of keeping up. It was doubtless acquired in climes or in ages when snow was much more abundant and lasting, and is maintained now as a memory of the past. It may possibly within a coming milleniad be wholly laid aside, for it has its disadvantages when it is not helpful.

In the *Hedgehog* we have another good instance of the hereditary survival of a habit. Probably in some colder age, or climate, he learned the comfortable but idle habit of feasting himself fat—very fat—in autumn, and then going to sleep —soundly to sleep—for the whole of the winter. He will get up in spring thin and hungry, in time for early worms and eggs, young birds, and possibly infant mice. It cannot be

said that, although not absolutely necessary, his habit is greatly out of place in our own rather dreary English winters; but its perpetuation is almost absurd in one of his relatives, who keeps it up in the sunny climate of Madagascar.[1]

All our English *Bats* fatten in autumn and sleep through the winter. They do not store food.

Next come the little *Shrews*. They are not mice, that is, not rodents, but belong, like the hedgehog and the bat, to the insect-eaters (Insectivora). What do they do in winter? We should like to know.

The Mouse division of the great tribe of *Rodents* have most of them, or at any rate many, two strings to their bows. They both store up food and hybernate. Their winter sleep is not nearly so profound as that of the hedgehog and the bat. They rise occasionally, go to their stores, and then back to bed. The squirrel, a rodent, but not exactly a mouse, has the same habit. Hares and rabbits, although rodents, neither store nor hybernate. No doubt they sleep a great deal, but not continuously. They suffer much in long-continued snow, and get thinner. The snow serves them a good purpose, however, in enabling them to mount upon it, and to reach stems and twigs which would be otherwise inaccessible. Under such conditions they live much on bark and do most provoking damage.

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[1] See Note on the Tenrec, p. 245.

ON THE STUDY OF FUNGALS.

With intentional and, we hope, pardonable ostentation, we published in our last month's Gazette a long list of the fungi then exhibited in our Vivarium. It occupied two pages. Our object in doing this was to draw attention to the extent of the opportunities for field study in October, which this group of vegetables, may we say of flowers, affords. To many, the long specific names given in our list would be meaningless, and might be regarded with that feeling of almost repulsion which pedantry and the attempt to exhibit superior knowledge always naturally excites. To some the list might not improbably suggest a hopeless disinclination to undertake the study of fungi at all. "If it is needful to master and keep in memory all these long and often unpronouncable names, I must leave the whole thing alone." Those who had inspected the collection would, however, have been enabled to rise above both one and the other of the impressions referred to. They would have seen that the Greek or Latin names which at first sight look so formidable denote objects which are very real, often very beautiful, and always of great interest. They would have realised also that no charge of pedantry can be sustained, inasmuch as the collectors of fungi have no choice but to use names coined from the dead languages, since there are in most instances none available in English. It is not needful to speak of a daisy as *Bellis perennis*, because it is well known and much loved under its Anglo-Saxon designation. In the case, however, of *Inocybe echinata*, *Ulocolla foliacea* and a multitude of others, the botanist has no choice. The extent to which, in Fungology, the well-instructed can "regard the weakness of his peers," by avoiding technicality, is much restricted.

Whilst, however, we are obliged to insist that the student

of fungology must take courage and be prepared to master a certain number of learned words, we are by no means of opinion that our teachers might not with a little effort, and some attempt at the conciliation which is so needful in all the affairs of life, do much to make the subject more accessible, and therefore more attractive, to those who know only English, and whose memories it is undesirable to tax too severely.

If we venture to make suggestions in detail as to how the fascinating study of fungi might be as it were thrown open to all, it may be asked, to begin with, whether it would not be an improvement to speak of a fungal rather than a fungus. We have the authority of a distinguished botanist for such an innovation. Fungal is a word in which the hardness or softness of the letter "g" can scarcely come into question, and it admits of the formation of a plural in the English fashion by adding the letter "s." The change would, of course, be distasteful at first to the educated and accustomed ear, but this in a little time might be surmounted, and it would be a gain to all beginners. Many other changes for the better would be accomplished without any violence to language. The agarics would become "gilled fungals," the leucosporeæ, melanosporeæ, &c., simply the white-spored, black-spored, &c., &c. "Spine fungals," "tube fungals," "cup fungals," "dust fungals" and the like would carry their own meaning, and would denote just as much as the quasi-classical terms now employed.

There are many substantive names now in use which, although not of English derivation, yet come quite easily on the English tongue. These may advantageously be retained. Boletus, Agaric, Polypore, Peziza, are probably amongst these.

We have admitted that a great number of the different species can be known only by their learned names, but there are not a few which already have very appropriate colloquial designations. "Mushroom" must remain the name

for *Agaricus campestris* and *A. arvensis*, and it is impossible to name the stately long-stalked *Lepiota procera* better than the "Parasol." So of many others.

The attractions of the Fungal family, as affording material for Nature-study, are manifold.

They stimulate faculties of close observation in those who collect them, by the great variety offered in the characters by which they are named and grouped.

They come for the most part at a time of year when the rest of the vegetable world is comparatively at rest, and thus add a zest to out-of-door rambles just when one is most needed. Very many of their species are, when looked at, singularly elegant and beautiful, both in form and colour, whilst at the same time so unobtrusive that they are liable to be entirely overlooked unless sought for.

They illustrate very curious and interesting biological laws. Many of them are content to remain entirely hidden underground for nearly the whole year. Their structures which are permanent are of insignificant size, and apparently quite inadequate to the production of the large upgrowths which spring from them. Although seemingly of soft substances and produced with extreme rapidity, they can yet exert great force, lifting stones, &c. They grow with unexampled rapidity, and seem to prefer to grow in the dark. They form no green substance. They exhibit most singular liabilities to disappear from given localities for years, and then again to come forth. They illustrate the importance of food-supply in relation to the production of specific forms, many of them being found solely in association with some special kind of wood or dung. That they are all related, the general similarity of large groups makes evident beyond doubt, yet their different species are now very numerous and are apparently quite permanent.

Much more might easily be written as to suggestive problems which fungals offer to the curious mind. We may conclude by remarking that there can be no charge of

cruelty against those who collect them, nor is there any fear that rare species may be exterminated. It would be an excellent thing if at all educational museums an autumnal exhibition of fungals could be annually got together. The show would probably improve year by year, field work would be pleasurably stimulated, and in addition to the development of local knowledge, some real additions to botanical science might from time to time be expected. We shall be much gratified if the Notes which we offered last month should prove helpful to those who may incline to attempt such exhibitions.

MR. MIALL ON PEDANTRY.

We quote the following observations from an excellent little book by a very distinguished naturalist :—

"As a very young man I used to defend the learned language of Botany and Zoology, and I know pretty well the arguments that can be used in favour of it. But when I came to teach Natural History to others, I quickly felt what a hindrance the language is to those (the vast majority, of course) who read no Latin or Greek. Only a few ever come to master it, and most of those few are the worse for what they seem to have gained. For the technical terms are allowed to count as real knowledge. The student with much labour learns to apply his rules of nomenclature to natural objects, and then thinks that he has made a step towards understanding the objects themselves. Very often he has only interposed a fresh barrier between his own mind and the world of Nature. Learned words easily disguise the want of observation and thought. You may set down all the formulas respecting a plant that ingenious pedantry can devise, and yet know nothing about it that signifies. The more learned the phrase the easier it is to deceive yourself. With few exceptions every result of the study of Nature which is at once well ascertained and important can be adequately expressed in plain English."—Miall's "Round the Year," p. 209.

AUTUMN LEAVES.

The influences under which the changes in colour of leaves in autumn are brought about, may be placed in several groups. In all of them some lowering of standard of health is involved. If a green leaf retains its full vigour it remains green, but any interference with that vigour will be followed by change in colour. What the change may be will depend upon the original constitution of the plant. The Virginian creeper will produce scarlet, the beech mahogany brown, the elm yellow, and so on. The commonest of all causes of change is simply age. The leaf has become senile and is about to die. In this case all the leaves on the same branch will suffer more or less together, and usually all in the same manner. The changes in colour will begin at the top and edges of the leaf, and will affect all parts of it, that is, they will have bilateral symmetry. The parts last to change will be those nearest the mid-rib and large side "veins." These structures carry the sap tubes, and supply best the parts nearest to them. In many cases a very beautiful pattern is produced by the green bands which remain to the last placed in symmetry on each side the mid-rib. Next to the top and borders, the parts which change colour are broad, ill-margined bands between the veins. This statement is, of course, only another way of saying that the veins keep green the longest.

Next in importance to age we have the influence of injuries. These may be either of the leaf itself or of its footstalk, or of the twig on which it is borne. If the stem or footstalk be damaged the natural onflow of sap may be diminished, and the part of leaf supplied will certainly change colour. If it be part of the footstalk of the leaf itself it may be that only one half of the leaf will change, but if the twig is involved, then the whole leaf will suffer, and the changes

will be much like those of old age. It will be a case of premature ageing. The possible injuries to the leaf itself may be very various. There may be a burrowing grub, and the mined portion of the leaf will die and change colour. It may be a huge blotch, as in the common dock, or an elegant gyration, as in the bramble and many others. It is never, except by mere chance, symmetrical, and seldom involves the mid-rib.

The growth of the smaller fungals on leaves often produces beautiful changes in their colour. The patches on bramble leaves, often becoming in late autumn of a blood red colour, are caused by the growth of plots of the *Phragmidium bulbosum* on the under surface. These changes in colour may be arranged with symmetry if the fungal chance to have been so planted, but more usually they are quite irregular. A good example of another class of fungal-caused changes is very frequent in the patches like splashes of tar which occur on sycamore leaves. In this instance, however, the fungal itself produces the patch and the colour, rather than causes the leaf to do so. There are a great variety of fungals which grow on leaves and cause colour-changes. The growth of galls on leaves may cause colour-changes in two different directions. If on the under surface of the leaf, as in the commonest of all instances, the cheese-cake gall of the oak leaf, they usually cause the part to die, and a patch of brown is seen on the surface. If very abundant they may kill the whole leaf, but not until the gall has had time to attain its own growth. If the galls grow from the upper surface of the leaf, instead of killing the part, they appear to maintain its nutrition by continuing to attract sap when the rest of the leaf has ceased, owing to age, to be able to do so. Most interesting illustrations of this curious fact may often be picked up under beech trees. Certain of the fallen leaves will be noticed to have streaks of bright green on them, and on careful inspection there will be found on these one or more of the galls of the *Hermomyia peligera*. The galls themselves keep green, and the

part of them which is of vegetable production is evidently still living. Much depends upon whether the gall itself is living or dead. In the case of the oak, the egg within is, of course, alive, but the vegetable structure which encloses it is dead. It is a necessary consequence that it should die, if it kills the part of the leaf on which it grows, and from which it derives its own nutriment. The lesson in biology which we here learn is one of great interest. The changes in colour caused by galls like those from fungals are never, except by accident, alike on both halves of the leaf (bilateral symmetry). Although living and still growing galls appear to be the most efficient agents in maintaining the green chlorophyll in dying leaves, they are by means the only ones. Many kinds of injury may do it. The burrows of leaf-miners are often seen surrounded by green. The retention of colour probably follows on changes in structure which have been induced. Insects which prick leaves in order to suck the sap may cause colour-changes. Those of the aphis or plant-lice tribe are the most common offenders. Oak leaves may be gathered speckled all over with pin-head spots of white, and on looking under them aphides will be found in all stages of development.

We have by no means said all that might be said with profit as to the changes in colour of autumn leaves. Enough has, however, perhaps been said to enable any one who has made a collection of such leaves to group them in connection with the causes which have been influential, and to observe their differing features with intelligence.

We shall give next month a descriptive list of the specimens which have been on exhibition at the Haslemere Museum recently. We purpose to give also a list of the drawings which we possess in illustration of the subject. Most of these have been beautifully drawn in water colours by a skilful artist. If ever the subscription list to our Gazette should enable us to do it without too heavy loss, we shall be glad to present our readers with a selection from them.

OUR PORTRAIT GALLERY.

Mary, I want a lyre with other strings ;
Such aid from Heaven, as some have feign'd they drew.
An eloquence scarce given to mortals ; new
And undebas'd by praise of meaner things !
That ere through age or woe I shed my wings
I may record thy worth, with honour due,
In verse as musical as thou art true—
Verse that immortalises whom it sings !
But thou hast little need : There is a book,
By seraphs writ, with beams of heavenly light,
On which the eyes of God not rarely look ;
A chronicle of actions, just and bright !

There all thy deeds, my faithful Mary, shine,
And since thou own'st that praise, I spare thee mine.

Portrait No. IV. of last month's Gazette (here reproduced), is that of a lady with a remarkably round face. The forehead is broad and rounded, the nose of good size, the mouth small, the chin also small and somewhat pointed. The expression is intelligent, sedate, mild and pleasing. The dress, which constitutes the only accessory, is quaintly plain, and implies a high degree of neatness, and at the same time intentional avoidance of personal adornment.

The face is that of Mrs. Unwin, Cowper's Mary; one to whom the whole English race owes a deep debt of gratitude. In the year 1763, Cowper, then aged 33, was placed under the care of an alienist, Dr. Cotton, at St. Albans, and after remaining there two years he was well enough to remove to Huntingdon. There he met the Unwins, and, charmed with their society, he became an inmate of their home. Mr. Unwin, a clergyman, died in 1767, and the family removed to Olney, Cowper accompanying them. Mrs. Unwin died in the latter part of 1796, having been for long an invalid. During the thirty years which had intervened, she had tenderly watched over the moods of the often unhappy poet, and done everything in her power to mitigate and soothe his melancholy.

It was to her that he addressed the lines we have quoted, and when she herself became the patient, he in turn watched at her bedside and nursed her with the deepest tenderness. There had possibly never been any serious thought of marriage, Cowper's state of health and frequent mental illnesses putting that out of the question. Their attachment was one of the

utmost purity, and at the same time it was deep and uninterrupted. Cowper lived four years after Mrs. Unwin's death. That event had caused him great distress, but he was in a feeble state of mind, and it is said that after one wild, passionate exclamation, he never again mentioned her name.

It was to Mrs. Unwin's suggestion that we owe the best of Cowper's writings. She was constantly seeking to find for him occupation which should absorb his thoughts and

prevent him from dwelling upon memories which caused depression. Hymns were his first composition, and the "Progress of Error," "Table Talk," "Truth," "Expostulation," and best of all, "The Task," &c., followed.

Mrs. Unwin was senior to Cowper and her position was half motherly. Cowper was 66 when Mrs. Unwin died. Her maiden name was Cawthorne, and she was born at Ely.

During the years 1794 to 1796 she had repeated attacks of paralysis, and finally sank into a state of mental decrepitude. In Cowper's correspondence during the years 1790 and onwards, there are frequent references to Mrs. Unwin's health. The following extracts from the poet's letters give us a glimpse of their social life; under date November 29, 1788, Cowper, writing to a friend, remarked:—

> "Lady Hesketh and Mrs. Unwin are both talking as if they designed to make themselves amends for the silence they are enjoined while I sit translating Homer. Mrs. Unwin is preparing breakfast, and not having seen each other since they parted to go to bed, they have consequently a deal to communicate."

On December 6 of the same year:—

> "An almost general cessation of egg-laying among the hens, has made it impossible for Mrs. Unwin to enterprise a cake."

Again, during the same winter he writes:—

> "That you may not suppose us all sluggards alike, it is necessary, however, that I should add a word or two on this subject in justification of Mrs. Unwin, who, because the days are too short for the important concern of knitting stockings and mending them, generally rises by candle-light."

Mrs. Unwin's face may be taken as a good type of features which are not very uncommon. It is a very short, round face, with no exaggerated characteristics. It is repeated, if we may trust *Vanity Fair*, very closely indeed in that of a well-known member of the House of Commons whose name we shall not give. No such delicacy need be observed, however, in the case of Sir James E. Smith, the distinguished botanist. Smith's portrait is given in vol. vi. of Nichol's "Illustrations of Literary History." He and Mrs. Unwin

might have been brother and sister. He was a Norwich man, and the son of a mother "revered for benevolence, cheerfulness and activity." He was himself a man of untiring industry, and of great amiability of character. His biographer states that his moral and religious qualities were deserving of the highest praise. ". . . It was his constant and earnest desire to banish jealousy and rivalship from the pursuits of science, and to cultivate a union and good understanding between the botanists of all nations." He was by creed a Unitarian, and sacrificed a professorship at Cambridge to his religious convictions. If we mistake not, his character is well expressed in his face, and allowing for difference in sex and surroundings, probably much the same might be assigned to Mrs. Unwin. Such faces may, perhaps, be considered as implying patience, amiability, and freedom from passion. They are probably usually coincident with rather short stature.

Portrait No. V. in last month's Gazette (here reproduced for convenience of reference) is that of Fénelon, Archbishop of Cambray in the time of Louis XIV., and the author of "Telemachus."

Features.—The forehead is rather high, but sloping and narrow; eyebrows strong, and eyes moderately sunken; nose large and of sub-Roman type; mouth of average size with well-curved lips; chin light and pointed.

Expression.—Genial, smiling and benevolent.

Accessories.—Those of a Church dignitary.

On the whole, Fénelon's face is one to inspire trust and to suggest a lovable, sincere nature. The mouth especially is mild and mobile. The suggestion is perhaps rather of quick intelligence and sympathy, than of profound thought. The descent may be supposed to have been Italian-Gallic.

SCHEDULE OF THE LIFE AND TIMES OF FÉNELON.

DATE	AGE	BIOGRAPHY	CONTEMPORARY EVENTS
1651 to 1660	1 to 10	A delicate, sensitive, intelligent child. His ancestors had held high stations in Politics, Army, and Church.	Louis XIV. eight years King of France. Bossuet, aged 24. Mme. de Guyon, aged 3.
1661 to 1670	10 to 20	At the University of Cahors. Took degrees, and received dignity of Abbé. Uncle, Marquis de Fénelon, brought him to Plessis, Paris. Preached first sermon with much applause. At the Seminary of St. Sulpice.	
1671 to 1680	20 to 30	Curate of St. Sulpice. Desired to go as missionary to Montreal. Desired to go as missionary to Greece. He was engaged from 1676-85 in quiet and successful labours as superior of the Community of Nouvelles Catholiques, which had for its chief object the instruction of young women re-	Invasion of Holland by Louis, 1670 to 1677. Peter the Gt. born. Siege of Vienna by the Turks.
1681 to 1690	30 to 40	cently converted from Protestantism. During this period he wrote his treatise "On the Education of Girls," and another "On the Office of Pastors." Sent by the King to Poitou to convert the Protestants. Became preceptor to Duke of Burgundy.	Revocation of Edict of Nantes. James II. William and Mary.
1691 to 1700	40 to 50	Explication des Maximes des Saintes. Made Archbishop of Cambray. Friendship with Madame Guyon, "the Quietist." Befriended at Court by Mme. Maintenon, "Telemachus" published (surreptitiously). Banished from Louis XIV. Court. Condemnation by Pope.	Innocent XII., Pope. Treaty of Ryswick.
1701 to 1710	50 to 60	Retired to his see at Cambray, where he lived the remainder of his life. Residing at Cambray.	War of the Spanish Succession. Death of Wm. III. Anne. Death of Bossuet. Battle of Blenheim. Peter the Great's reforms in Russia.
1711 to 1715	60 to 64	Death of Duke of Burgundy. The "Dialogues des Morts." Death of his friend, Duke de Beauvilliers. Died January 17, 1715.	Death of Queen Anne. George I. Louis XIV. died, Sept., 1715.

MEMORANDA.

Francis de Salignac de la Mothe Fénelon was born at the Castle of Fénelon, in Perigord, on August 6, 1651. His father was an old man when he was born. Horace was through life his favourite poet. Fénelon may be described as a Roman Catholic Quaker. His "Maximes des Saintes" is a parallel book with William Penn's "No Cross no Crown" (1627 to 1696). The character of Molinos, "the Spanish Quietist,"

FÉNELON (1651-1715).
Archbishop of Cambray and Author of "Telemachus."

may be profitably compared with that of Fénelon. Bossuet (born 1627, died 1704) was twenty-four years older than Fénelon. Cambray, or Cambrai, is on the Scheldt, thirty-two miles south of Lille. An excellent life of Fénelon will be found in Lear's "Christian Biographies." Madame de Guyon was three years older than Fénelon. Leclerc's edition of Fénelon's

works is in 38 volumes. Andrew Ramsay, a Scotchman, visited Fénelon at Cambray, became a convert to Catholicism, and wrote an interesting life of Fénelon.

His biographer, Saint-Simon, says of him: "In everything he was a true bishop, in everything a grand seigneur, in everything the author of "'Télémaque.'"

When composing books for his pupil, the young Duke of Burgundy, he continually reminded himself, "What I am going to say to this child will be the occasion of happiness or misery to twenty millions of people."

The works of Fénelon are very numerous, consisting, besides the romance of "Télémaque," of a variety of religious and moral treatises. "Télémaque" has been translated into every European language, and was until recently read in every European school. So much use does he make of the imaginative faculties that he exhorts teachers to impress on the minds of children that the Deity is "sitting on a throne with very bright eyes looking through everything, and supporting the universe with His hands." Hence his natural theology is chiefly the ejaculation of a pious man admiring the works of Nature. In politics Fénelon's opinions are far in advance of his age and country.

It may assist the memory to note that he died only a few months before Louis XIV. The King was, however, thirteen years senior to the Archbishop. With this difference their lives ran contemporaneously. Fénelon, in common with the majority of his French contemporaries, had never taken part in the festivities of a Coronation, his whole life having been passed under the sovereign in whose reign he was born.

The following word-portrait by Saint-Simon in his memoirs pictures Fénelon as

"A tall, lean, well-made man, with a large nose, eyes full of fire and intelligence; a physiognomy resembling none which I have elsewhere seen, and which could not be forgotten after it had been once beheld. There was such a sublime simplicity in his appearance that it required an effort to cease to look at him. His manners corresponded to his face and person. They were marked with that

ease which makes others easy; there was an inexpressible air of taste and refinement in them. He possessed a natural eloquence, a ready, clear, and agreeable elocution, and a power of making himself understood upon the most perplexed and abstract subjects. With all this, he never wished to appear wiser or wittier than those with whom he conversed, but descended to every one's level with a manner so free and so captivating that it was scarcely possible to leave him."

The diocese of Cambrai was often the theatre of war, and experienced the cruel ravages of retreating and conquering armies. But an extraordinary respect was paid to Fénelon by the invaders of France. The English, the Germans and the Dutch rivalled the inhabitants of Cambray in their veneration for the Archbishop. All distinctions of religion and sect, all feelings of hatred and jealousy that divided the nations, seemed to disappear in his presence.

"It is impossible," says his biographer, "to conceive how much he was the idol of the military, and how Versailles, in spite of her stern master, resounded with his name. His charity and polite attentions extended equally to the prisoners of war, as to his own countrymen. Virtue herself became more beautiful from Fénelon's manner of being virtuous."

We append a space-for-time Schedule of the Life and Times of Fénelon.

By the courtesy of Messrs. Constable, the publishers of Mr. Carlyle's "Life of Cobbett" (see review at p. 369), we are enabled to present our readers with a very interesting portrait, which supplements those we have already given. It is a caricature by John Doyle, and represents a meeting of Cobbett with his friend Sir Francis Burdett. It is a caricature only in the better meaning of that word, that is, in giving conspicuous emphasis to the characteristic peculiarities of those represented. We may neglect the meaning which the artist has put into the picture as a whole—that is his affair, and we are interested chiefly in estimating the men's features. In these the two offer an instructive contrast: Burdett has a much larger nose and a much smaller lower jaw than

COBBETT AND BURDETT.

From Carlyle's "William Cobbett," by permission.

Cobbett. His skull is long, while that of Cobbett is round, and whilst it rises higher it does not suggest the same capacity of forehead. Cobbett's is probably the larger head, and it is certainly the one most symmetrically moulded. Burdett's long neck and lanky figure contrast strongly with the muscular and burly frame of his companion. Cobbett probably had the better appetite and the better digestion, and his short neck gave him a decided advantage as regards the supply of blood to the brain. Burdett's long Roman nose may be allowed to imply a descent which carried with it obstinacy and self-assertion. The two men were in turn sentenced to fine and imprisonment. Cobbett submitted and made himself as comfortable as he could in jail (see our last month's frontispiece); the constables had to carry Sir Francis out of his house. Both changed their political opinions as life advanced—Burdett with the self-confident enthusiasm of youth began as a Radical and demagogue but ripened into a Tory. Cobbett's caution made him a Tory in the first half of his life, whilst his larger brain enabled him to accumulate experience which landed him as a zealous reformer in mature age. In this instance it cannot be said that physiognomy is deceptive.

Cobbett's Personal Appearance.

Miss Mitford, who visited at his house, says, "He was a tall, stout man, fair and sunburnt; with a bright smile and an air compounded of the soldier and the farmer, to which the habit of wearing an eternal red waistcoat contributed not a little. He was, I think, the most athletic and vigorous person that I have ever known; nothing could tire him."

There are caricatures by Gilray and others in which Cobbett figures; some of these are well reproduced in Mr. Carlyle's interesting book. In all, he is represented as a tall, stout, almost burly man, with full cheeks, a double chin, large head and an intelligent, but nowise characteristic general expression of face. It will be observed that Miss Mitford says nothing as to his features, his small nose contrasts strongly with that

of his frequent companion, Sir Francis Burdett; his nose is a weak feature, but it is, perhaps, not out of harmony with the rest of his face, nor with his character.

"He was indeed one of the stoutest men in the House. . . . His hair was of a milk-white colour, and his complexion ruddy. His features were not strongly marked. What struck you most about his face was his small, sparkling, laughing eyes. When disposed to be humorous yourself, you had only to look at his eyes, and you were sure to sympathise with his merriment. When not speaking the expression of his eye and his countenance was very different. He was one of the most striking refutations of the principles of Lavater I ever witnessed. Never were the looks of any man more completely at variance with his character. There was something so heavy and dull about his whole appearance that any one who did not know him would at once set him down for some country clodpole, to use a favourite expression of his own. His usual dress was a light grey coat of full make, a white waistcoat, and kerseymere breeches of a sandy colour. When he walked about the House, he generally had his hands inserted in his breeches pocket. Considering his advanced age, seventy-three, he looked remarkably hale and healthy, and walked with a firm but slow step."—Watson, 1835.

"Had I met him anywhere else save in the room and on that occasion, I should have taken him for a gentleman farming his own broad estate. He seemed to have that kind of self-possession and ease about him, together with a certain bantering jollity, which are so natural to fast-handed and well-housed lords of the soil. He was, I should suppose, not less than six feet in height, portly, with fresh, clear, and round cheek, and a small grey eye, twinkling with good-humoured archness. He was dressed in a blue coat, yellow swan's-down waistcoat, drab kerseymere small-clothes, and top-boots. His hair was grey, and his cravat and linen fine and very white."—Bamford, 1818.

Hazlitt, in his Table talk, records :—

"Mr. Cobbett speaks almost as well as he writes. The only time I ever saw him he seemed to me a very pleasant man, easy of access, affable, clear-headed, simple and mild in his manner, deliberate and unruffled in his speech, though some of his expressions were not very qualified. His figure is tall and portly. He has a good sensible face, rather full, with little grey eyes, a hard square forehead, a ruddy complexion, with hair grey or powdered."—Quoted from Miss Wotton's "Word Portraits."

NOTES AND EXTRACTS.

Colour-sense in Birds.—There may be seen in the local collection in our Haslemere Museum a hedge-sparrow's nest, the materials of which consist largely of fragments of coloured wool, mostly red, from a carpet which had been beaten near the nesting site. It was found in Haslemere, three summers ago.

In *Science Gossip*, 1867, p. 275, there is an allusion to a hedge-sparrow's nest which "was made in the usual manner, but in the place of moss, &c., it was composed of woollen fibre of various colours, *red being the most prominent*, evidently a portion of an old carpet." It is obvious that this may prove rather the bird's love of wool than preference for colour. There have, however, been recorded from time to time facts which seem to imply that birds have some colour-sense. Dr. McDougal, writing in 1903, remarked that he had seen a robin's nest built of similar materials, and suggested that "if any readers, having gardens where birds build nests, would, at the suitable season, scatter about in those gardens bits of wool of different colours, but similar in shape and substance, they may arrive at valuable facts regarding the colour vision and colour preferences of birds."

The Roadside Planting of Fruit Trees was discussed at the International Congress on Arboriculture of 1900, and a resolution was passed to the effect—

"That planting of fruit should be encouraged, and that such trees should take the place of large trees, such as oak and beech, whose far-reaching roots and great shade are injurious to the adjoining land."

The French have paid much attention to the subject, and in 1901 it was stated that there were half a million fruit trees planted along French roads. The cider apple is the most commonly employed. Perhaps good edible varieties would prove too great a temptation to adults as well as juveniles! The practice also obtains in Germany. We read that in 1901, in Hanover, 189,586 trees were planted on the roadside by the provincial Government, and although a large proportion of them were not in full bearing, the authorities netted a revenue of £8,386.

In Switzerland the Virginian creeper ripens its berries. In the Bernershof Hotel at Bern there is a window of the Salle à manger which is embowered in festoons of that plant. On October 14 last, the writer sat at lunch in that window. Outside the window the birds were lunching also. First came eight or ten starlings, and, having feasted, flew away together. Then one by one blackbirds arrived until there were near a dozen. They ate rapidly, as if half conscious of being thieves, but not the less freely on that account. One of them was counted to swallow ten berries without changing his place and as fast as he could open and shut his bill. Another took twelve and a third managed fourteen. The berries were as large as big peas. Meanwhile, a fine cock-sparrow came, evidently thinking that where grub was going he ought not to be absent. After watching, with an occasional chirp, for some minutes, he decamped with an almost audible ejaculation, "I can't eat those things, and I wonder that you can."

The railway which climbs up from Mombassa to the inland plateau is one of great interest to the tourist. The wild animals have got accustomed to the trains and even seem curious to observe them. You may see herds of zebras, a hundred or even a thousand strong, galloping alongside past

the slow moving line of carriages. Not infrequently a troop of giraffes will appear. On one occasion a passenger witnessed the attempt of half a dozen of these animals to cross the line in front of the train. One of them, a tall bull, had not sense enough to duck his head and was caught across the throat by the telegraph wire on the other side. Still he would not stoop, but continued to struggle with the impediment until the train had passed, when he turned and went back.

A fine specimen of an uncommon insect, the Striped Hawk-Moth (*Deilephila livornica*), was taken last August in Whitmoor Bottom, Greyshott, Hants (about five miles from Haslemere). It was acquired by Mr. H. Watkins, of Ridgeways, Hindhead, who kindly presented it to the Haslemere Museum.

It is of sporadic appearance in this country. Some years there are few or no records, occasionally it appears in some numbers. Its census is apparently not influenced by meteorological conditions. It was abundant in the cold wet year of 1860, also in the fine hot summer of 1870.

Leaf Miners.—In reply to a query, the Rev. E. N. Bloomfield has kindly supplied us with the following notes :—

The oval mines on the oak leaves are those of a *Lithocolletis*, a genus of small moths which all make very similar mines and pupate within the mines. I cannot tell you which species, probably all are the same. There are eight or nine species in Britain which feed on the oak, on the underside of the leaf, and the mines are very similar. There are other species which feed on other trees, thus: *L. sylvella* on maple, *L. faginella* on beech, *L. coryli* on the upper side of hazel, *L. nicelii* on the under side of hazel, *L. pomifoliella* on apple and *L. menaniella* on evergreen oak. Some trees have two species of *Lithocolletis*, some four, and the oak eight or nine species. All the mines are much alike, very few feed on the upper surface.

The serpentine mine on the upper side of the oak leaf is that of a *Nepticula* (small moth), probably *N. ruficapitella* ; there are only two British nepticulæ which feed on oak in this manner. Sometimes you may find a green patch in the middle of a yellow oak leaf, containing, in a small blotch, the larva of *N. suffimaculella.* The genus *Nepticula* has very numerous species on various trees, shrubs and herbs. They all, or nearly all, come out when full fed and pupate among dead

leaves, &c. You must not suppose, however, that *all* the serpentine mines are those of *Nepticula*. There is a *long* serpentine, or somewhat serpentine one to be found in leaves of cherry, apple, &c., caused by *Lyonetis clerckella*. The very numerous blotches on laburnum leaves are caused by *Cerneostoma laburnella*, and the pupa may often be seen in its silky cradle among the leaves and branches, the imago comes out in the months of May and August.

The *Lithocolletis* may be bred by collecting the mined leaves and putting in rather small corked bottles, but as they do not come out until May there is a difficulty in preventing their becoming mouldy on the one hand or too dry on the other. The easiest way of breeding a species of *Lithocolletis* to see what it is like, is to collect *L. menaniella* mines in April and bottle them as I have said; the imago will appear in May or earlier if in the house, and hence somewhat warm.

Radium and the Possible Duration of Time.—"Radium has been proved to give out enough heat to melt rather more than its own weight of ice every hour; enough heat in one hour to raise its own weight of water from the freezing-point to the boiling-point. After a year and six weeks a gramme of radium has emitted enough heat to raise the temperature of 1,000 kilogrammes of water one degree. And this is always going on. Even a small quantity of radium diffused through the earth will suffice to keep up its temperature against all loss by radiation! If the sun consists of a fraction of one per cent. of radium, this will account for and make good the heat that is annually lost by it.

"This is a tremendous fact, upsetting all the calculations of physicists as to the duration in past and future of the sun's heat and the temperature of the earth's surface.

"The geologists and the biologists have long contended that some thousand million years must have passed during which the earth's surface has presented approximately the same conditions of temperature as at present, in order to allow time for the evolution of living things and the formation of the aqueous deposits of the earth's crust. The physicists, notably Professor Tait and Lord Kelvin, refused to allow more than ten million years (which they subsequently increased to a hundred million), basing this estimate on the rate of cooling of a sphere of the size and composition of the earth. They have assumed that its material is self-cooling. But, as Huxley pointed out, mathematics will not give a true result when applied to erroneous data. It has now, within these last five years, become evident that the earth's material is *not* self-cooling, but, on the contrary, self-heating. And away go the restrictions imposed by physicists on geological time. They are now willing to give us not merely a thousand million years, but as many more as we want." (From the inaugural address, York Meeting of the British Association, by Professor E. Ray Lankester, F.R.S., President of the Association, *Nature*, August 2, 1906.)

The Okapi.—Some interesting notes on the habits of this rare mammal were recently contributed to the *Times* by Mr. P. H. G. Powell-Cotton, who has spent ten months in the Ituri Forest in search of it. His quest was a fruitless one, and the information given was supplied to him by the Mambutti (pygmies) hunters.

The Okapi, in native language "Kangi," is usually solitary ; even the male and female feed apart, though with their family of one frequenting the same part of the forest.

It is very timid and restless, never remaining long at rest in one place. In wet weather it sometimes seeks shelter in an abandoned native hut, and there licks the mud and rain from its glossy coat. It is chiefly on these occasions that the natives are able to shoot or spear it.

Vitality of Seeds.—Writing under the initials "H. B. P.," a correspondent has recently contributed to *Nature* another remarkable instance of suspended germination.

He says that in February last he removed a wall (with foundation stones) which formerly fenced an oak wood on a hill on a north country farm. The wood was planted and fenced probably between 1600 and 1610, and felled forty years ago. In late spring the site of the wall became carpeted with seedling foxgloves. There were no foxglove plants within several hundred yards, and it was noted that no foxgloves were produced upon disturbed turf outside the site of the wall. "H. B. P." is of strong opinion that the seeds "were right underneath the foundation stones of the wall, and had lain there ever since it was built." He adds that on the same farm he had occasion to remove a quantity of top-spit from a field traditionally called the "Barley-field," and place it on another part of the grass. Afterwards corn weeds such as fumitory and sunspurge, previously unknown in the pastures, came up in great abundance.

OUR LEXICON PAGE.

It will be our constant endeavour to express ourselves in plain English with as few learned terms as possible. The latter, however, cannot be wholly avoided even in the early stages of study, and they are increasingly needful as the pupil advances in knowledge. Ignorance of them is a most serious source of hindrance to students. We earnestly advise our readers to procure good lexicons and dictionaries and to take great pains to become acquainted with the meanings of all the words which they encounter. The knowledge of the meaning of a word, previously obscure, will often at once clear up a difficult subject and render advance easy where before it was impossible. Our Lexicon page is designed to give in familiar language expositions of technical words in common use. We shall not attempt any alphabetical arrangement, but shall be chiefly guided in our selection by the subjects which from time to time come under discussion in our Gazette. We advise our readers to study our explanations regularly, whether or not the information is needed at the time.

Sporophore, lit., the spore-bearer. All the visible outgrowths of fungi, *e.g.*, mushrooms, &c., are sporophores; that is, they are destined to develop and carry the spores of the plant. The sporophores of some fungi live for many years and become woody. Plowright defines as sporophore "a mycelial hypha that bears spores."

Hypo-myces, lit., upon fungi. The name given to those mould fungi which grow on other fungi.

Hymeno-mycetes, lit., a fungus which possesses a spore sheet or hymenium. It is used in a more restricted sense to designate the family of fungi in which the spore-bed is from the first exposed and without covering. It is thus made to distinguish certain other forms from the Gastero-mycetes and the Asco-mycetes.

Gastero-mycetes, lit., stomach-fungi. Fungi in which the spore-bed or hymenium is, until ripe, concealed in a protective skin or coat.

Haustorium, lit., a sucker. When applied to fungi it designates a short tube branching out from a spore or hypha and penetrating the tissues of the host.

Campanulate, formed like a bell, might, for English readers, be suitably substituted by *Bell-shaped.*

Neolithic, new stone age. The prefix *Neo* means new or modern. If the word to which it is affixed begins with "o" then one "o" is omitted.

Myomorphic, lit., mouse-like. Allied to mice.

Bast. The inner bark of exogenous trees, the "liber."

Liber, lit., free. The inner part of the bark of exogenous trees. It is so-called because free, that is, not united to the stem inside it.

Alveolus, lit., a little trough. That part of the jaw bones in which the teeth are lodged. The alveolus grows with the development of the teeth and shrinks when they are lost.

Myco-rhiza, lit., fungus-root. The growth of fungi on the smaller roots of plants and trees, which are useful in preparing material for root-absorption.

Hypha, a single thread, or filament, of a fungus growing at its point. When numerous hyphæ are interlaced they form a *mycelium* or web. A hypha may bud out at its sides as well as grow at its point. It consists of a thin cellular membrane enclosing protoplasm, and differs from a spore, or cell, chiefly in its great elongation. Divisions or septa are often present.

Thallus. A web formed of interlacing hyphæ.

Sorus. A mass of spores arranged in a heap or cluster.

Hymenium, "spore mother-cells, aggregated in a continous layer upon a sporophore, or that specialised portion termed the receptacle."—*Cooke.*

(*To be continued.*)

SEASONAL NOTES.—DECEMBER.

Many of our common garden plants have recently been of great interest in reference to the autumn changes of colour. Three may be specially named—London Pride, the Chinese Bistort and the Barberry. The old summer leaves of London Pride show very beautiful tints of varying colour, which are developed at their margins. Pink, salmon tint, yellow and brown, occur in gradations to delight the eye of the painter. For the student of vegetable life, the points are that the colouration is peripheral (acroteric), that is, in the parts where the supply of sap is most difficult, and that it occurs in leaves which are not as yet about to die and fall. These leaves are thick and succulent and resist cold so far as actual death is concerned, but they cannot resist the changes of age. The leaves which have taken on colour are those of the past summer, and are now senile. They are serving as nurses for the new shoots for next year, which latter are already well advanced, and all of them of bright green.

The Chinese Bistort, as we remarked last month, shows, in a really wonderful manner, the influence of distance from sap supply upon the maintenance of nutrition. Its leaf dies first at its extreme tip, next along its extreme margin, and thirdly, in the spaces between the veins. Anyone who has patience to note these changes minutely will be much impressed by observing the influence which the veins have in locating the changes. Along the sides of these there is, in all the early stages of death of the leaf, a narrow belt which maintains its green colour.

A condition of burnishing, giving the part of the leaf affected an almost metallic lustre, often precedes the brown of impending death. This may be seen in the leaves of hazel but still better in those of the Bistort now under notice.

Everyone must have noticed the rich crimson colour assumed by leaves of the greater Barberry in the autumn. Sometimes it is only one leaf or one part of a leaf, sometimes all the leaves on one twig, or on one bough, and sometimes the whole shrub. If it be only one leaf or one twig, some injury to the footstalk or the stem of that twig may be looked for, and will usually be found. In the same way, if a whole bough loses its green and assumes colour, some damage to the bark may be suspected. There is now under observation in a garden at Haslemere a low Barberry shrub which exhibits on different branches all varieties of colour. It is close over a small drain-pipe, in the placing of which its roots have no doubt been injured. The leaves of the bough nearest to the pipe are grey brown, and obviously quite dead. Another bough has leaves of a brilliant crimson, and these on the side furthest away from the pipe are of various delicate shades of salmon tint on towards scarlet. Other bushes of the Barberry near to this are still quite green.

The hazel, like the bistort, allows its leaves to brown at their tips and edges long before the middle of the leaf is involved. It outstrips the bistort in that not only does the marginal portion become brown but it shrivels and curls up quite dead whilst the rest of the leaf remains alive.

The ash, which is often the last of our native trees to get its leaves in spring, keeps them long in the autumn. It is, however, very variable. Curiously, it breaks the rule of mos trees, under which small and young individuals keep their leaves longest. Before the writer's window stand in a hedge three ash trees, of about thirty feet high; they are all quite leafless, whilst a large spreading tree within a hundred yards of them is still in full green summer foliage. It is, according to the calendar, November 17, but the season is a month behind hand. Other large ash trees are quite leafless.

Beech trees lose their leaves first on the topmost twigs, whilst birches begin at the bottom and keep a tuft of green at the top to the last. Poplars go with the birches. Not only do the topmost leaves fall last; but they keep green after all the rest are yellow. These conditions may be observed on a large scale along some of the continental railway sides. Some of these are planted for miles together with rows of poplars. In October most of these are of golden yellow, all except the very top.

Along the railway sides in the Rhone valley, for instance, very interesting illustrations of individuality may now be observed in the poplars. Of two trees standing side by side one will be yellow whilst its brother is still green. In some instances a succession of twenty in double row may now have taken on autumn tints when the next hundred are still in those of summer. It might be suspected, when this is seen, that it is due to some difference in soil or exposure. That, however, is not likely. The explanation more probably is that the young trees supplied by the nurseryman were from different plots and have had peculiarities impressed on their organisation almost from their birth. They may possibly have been sown rather later in the year, or be from different parentage.

Birds are epicures, or perhaps even gourmets. They will clear the berries off one holly and leave those of another by its side untouched. This implies that the fruit has a different flavour, or perhaps a different degree of softness, and this again proves that trees of the same species and grown under similar conditions are yet not exactly alike. Even when the tree is one that they like, birds will reject and throw down more berries than they care to eat. At present time some of our hollies are quite stripped, others have not lost a berry, whilst under many the path is scarlet with berries which have been plucked and then rejected.

December Fungi.

Owing to the phenomenally mild season many fungi may still be found in our fields, lanes, and woods. To-day (December 4) the following agarics were observed: *Hypoloma fascicularis*, *Paxillus involutus*, *Laccaria laccata* (both colour forms), *Lactarius theogalus*, *L. turpis*, *L. subdulcis*, *Tricholoma nudum*, *Russula fellea*, *R. ochroleuca*, *R. xerampelina*, *Cantharellus aurantiacus*, *Clitocybe flaccida*, *C. fragrans*, *Collybia butyracea*, *C. velutipes*, *Galera hypnorum*, *Mycena polygramma*, *M. galericulata*, *Hygrophorus coccineus*, *H. psittacinus*, and *Coprinus micaceus*. Also *Boletus luridus*, *B. badius*, and several woody *Polyporeæ*.

The occurrence of such a large number at this time of the year is very unusual. As a rule, the only agarics to be found in December are *Collybia velutipes* and *Hypoloma fascicularis*.

AN ADDITION TO THE BRITISH FUNGUS FLORA.

Polyporus nodulosis, Fries.

Late in October I found, in one of the beech woods on Heyshott Down, a very beautiful fungus, a member of the genus *Polyporus*, which did not answer to the description of any of the species enumerated in Massee's "British Fungus Flora." I sent it to my friend, Mr. Carleton Rea (Hon. Sec., British Mycological Society), who kindly identified it with *Polyporus nodulosis*, Fries, a species hitherto not observed in this country.

It grew upon a dead, but standing, beech trunk, and formed a large patch about 15 feet long, and varying from 6 inches to nearly a foot wide.

The numerous imbricated pilei for the most part do not exceed 1 inch in diameter. They are a brilliant orange-red, zoneless and very silky. The pores are unequal and jagged; in the freshly gathered plant they present, when

viewed at different angles, various shades of pale cinnamon. In a dried specimen the colour of the pileus is not so bright and the pores are whitish.

The most distinctive feature, and the one very properly employed by the great Swedish mycologist for the specific name which he bestowed upon the plant, is the nodosities of the hymenium, which spreads over the interspaces between the pilei.

The woods on the South Downs near Heyshott (four miles from Midhurst, Sussex) had not, to my knowledge, been investigated by mycologists prior to my visit in the autumn of 1905. Since then I have made several excursions to them, and succeeded in finding many rare and interesting species. Notes upon some of these were given in the last month's issue of the *Museum Gazette*. The beech woods clothe both the north and south slopes of the Downs. Speaking generally, those on the north side are poor in fungi but rich in mollusca; from the tree trunks in spring and late autumn may be gathered *Clausilia laminata*, *C. bidentata*, and *Ena obscura*, whilst beneath them, in restricted areas, may be found the three very rare and interesting shells, *Helicodonta obvoluta*, *C. rolphii*, and *E. montana*. On the south side the conditions are reversed, molluscs are comparatively scarce but fungi abound. It was on this side that I found *P. nodulosis*, and excepting *Inocybe echinata*, all the Heyshott species commented upon in the notes on the Haslemere Exhibition of Fungi.

E. W. SWANTON.

GOETHE'S OPINIONS ON EDUCATION AND THE STUDY OF NATURE.

(*Continued from page* 316.)

"Figure to yourself Nature, how she sits, as it were, at a card table, incessantly calling *au double! i.e.*, exulting in what she has already won, through every region of her operations, and thus plays on into infinitude. Animal, vegetable, mineral, are continually set up anew after some such fortunate throws; and who knows whether the whole race of man is anything more than a throw for some higher stake!"

"As to Friar Bacon, extraordinary as was his appearance, it ought not to excite wonder in us. We know that rich germs of civilisation showed themselves in England at a very early period. The conquest of that Island by the Romans possibly laid the first foundations for its superiority. Such traces as they left are not so easily effaced as people think. At a later period Christianity made early and remarkable progress there. St. Boniface landed in Britain with a gospel in one hand and a carpenter's rule in the other."

"Believe me, this is a fragment of the earliest history of the human species. The intermediate links you must find out for yourself. He who cannot discover them will not be the wiser though he were told them. Our scientific men are rather too fond of details. They count out to us the whole consistency of the earth in separate lots, and are so happy as to have a different name for every lot. That is argil (thonerde), that is quartz (kiesclerde), that is this, and that is that. But what am I the better if I am ever so perfect in all these names?"

"We constantly talk a great deal too much. We ought to talk less and draw more. I, for my part, should be glad to break myself of talking altogether, and speak like creative nature, only in pictures. That fig-tree, this little snake, the chrysalis that lies there on the window, quietly awaiting its new existence—all these are pregnant Signatures; indeed he who could decipher them might well afford to dispense with the written or the spoken. The more I reflect upon it the more it strikes me that there is something so useless, so idle, I could almost say so buffoonish in talk, that one is awe-stricken before the deep, solemn repose and silence of Nature, as soon as one stands withdrawn into oneself, and confronted with her, before some massive wall or rock, or in the solitude of some venerable mountain."

"You have long known that ideas which are without a firm foundation in the sensible world, whatever be their value in other respects, bring with them no conviction to me; for that, in what concerns

the operations of Nature, I want to *know* not merely to conjecture or to believe."

He laid down the proposition, that Nature accidentally, and, as it were, against her will, became the tell-tale of her own secrets. That everything was told—at least once ; not only in the time and place at which we looked for, or suspected it : we must collect it here and there, in all the nooks and corners in which she had let it drop.

"In one of our former conversations, I called man the first dialogue that nature held with God. I have not the least doubt this dialogue may in other planets be kept up in a language far higher, deeper, and more significant. At present we are deficient in a thousand of the requisite kinds of knowledge."

This might possibly be the cause that our conversation took a direction towards the super-sensual, for which Goethe commonly showed a repugnance, if not a contempt—completely on principle, as it appears to me ; for it was more consonant with his natural disposition rather to confine himself to the present, and to all agreeable and beautiful objects which Nature and Art offer to the eye and observation, in paths accessible to us. Repugnance to the super-sensual was an inherent part of his mind.

With questions concerning time, space, mind, matter, God, immortality, and the like, Goethe occupied himself little. On one occasion he remarked :

"What led to this was that I was always more disposed to an examination of nature through the senses, than Herder, who continually wanted to hasten to the result, and grasped at the idea while I had hardly got through the observation ; but it was just this reciprocal stimulus that made us mutually profitable."

Goethe, as has been already remarked, loved nothing that was the fruit of mere study : nothing got by rote. He maintained that all systems of philosophy must form part of our affections and of our life.

NOTES ON THE WEYMOUTH-PINE RUST.

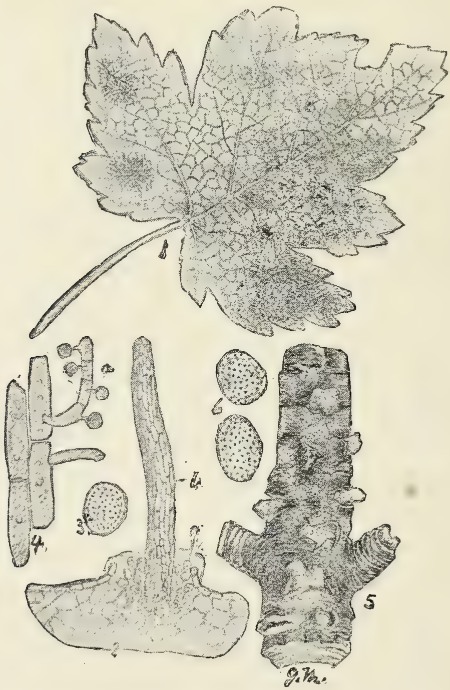
Opportunities have occurred at Haslemere during the last five years for some observations, of considerable interest, in reference to the fungus which causes this disease. The attack occurred almost exclusively in the first year of this series, and during the latter term only its results have been displayed. There has been no fresh prevalence. The following notes record the chief facts, amongst which may be mentioned the recognition for the first time in Britain of the *Tubercularia maxima* as a parasite upon the *Peridermium.*

The loan of a block, courteously afforded by the publishers of Mr. Massee's book (which we review at p. 370), enables us to offer an illustration of the fungus in its different forms.

In 1901 this disease was very prevalent at Haslemere; many Weymouth-pines in the district were damaged, and a few were killed. At Inval, where it was first observed in May, the crowns of the trees suffered severely, but many of the lower branches were also affected. The needles drooped and withered. At the base, or near it, of each infected branch, were found the pale yellow cups (æcidia) of the *Peridermium strobi.* These are shown, natural size, in fig. 5.

There was associated with these, in most cases, a purplish fungus which it was difficult to determine. Specimens were sent to Kew for identification, and were there recognised as the *Tubercularia maxima*, a parasite of the *Peridermium* hitherto not observed in this country. The æcidia of the Peridermium contain orange spores. Two of these, highly magnified, are shown in fig. 6. During the first season of the attack æcidia are not formed, only spermogonia. These contain spermatia, minute flask-shaped bodies seated on the tips of delicate threads (hyphæ) which spring from the inner basal surface of the spermogonium. The significance of these bodies is not properly understood, but they are now considered by many to be effete male organs. The æcidia appear in the second year.

The spores, when blown from the cups, are carried in the air to currant bushes, and, settling upon the leaves, they germinate, and the resulting mycelium ramifies in the tissues of the leaves. At first the presence of the parasite is not easily detected, but later on it is indicated by yellow spots, which



A CURRANT LEAF INFESTED BY THE CRONARTIUM, AND PORTIONS OF WEYMOUTH-PINE SHOWING THE PERIDERMIUM STROBI.
(From Massee's "Text-Book of Fungi," with the Author's permission.)
For explanation of details of text.

appear on the upper surface of the leaf in autumn. Immediately below such a spot the fungus will be found (fig. 1). It consists of a mass of very slender hair-like bodies (fig. 2) about one line long, and of a light brown colour, sometimes almost covering the whole surface. Each "hair" consists of uredospores and teleutospores which have grown together.

A uredospore is shown in fig. 3, whilst fig. 4 depicts four teleutospores, two of which are germinating ; one of the germ-tubes bears four promycelial or secondary spores. All the illustrations of spores are highly magnified.

Before the life cycle of this fungus was properly understood, the stage on the currant leaves was considered to be a distinct species of fungus, and was christened *Cronartium ribicolum.*

Curiously enough, it is said that the *Peridermium strobi* does not occur in America, the home of the Weymouth-pines! The Weymouth-pines in the plantation at Inval have been carefully kept under observation since the 1901 attack. In 1902 the Peridermium was not abundant. The ascophores of the larch canker (*Dasyscypha calycina = Peziza willkommii*) were, however, abundant on many branches which had been killed by the Peridermium the previous year.

In July, 1903, many of the trees showed the Tubercularia fairly abundantly.

In 1904 the trees yielded neither *Peridermium* nor *Tubercularia*, but the *Peziza* was abundant on dead and dying branches.

During the present year a few isolated branches on some of the trees have died; these bore ascophores of *Dasyscypha calycina.* The *Peridermium* has not been observed.

NOTICES OF BOOKS RECEIVED.

William Cobbett. A Study of His Life as Shown in His Writings. By E. I. Carlyle. One vol., pp. 318. Price 7s. 6d. net. Archibald Constable and Co.

We concluded what we had to say about Cobbett last month with the remark, "we reluctantly leave a most interesting subject," and in our Editorial Notes ventured to suggest a new life of Cobbett was a desideratum. We knew only of the too detailed and by no means impartial biographies of Huist and Edward Smith. The most unfortunate

internecine war now raging between certain leading publishers and the *Times* shuts out the former from their best means of publicity, and had we not at the last moment made reference to the *Times* Catalogue, by far the best guide to current literature, we should have known nothing of the work now under review. A postscript at p. 324 explained the circumstance, and supplied our apology for announcing as a want that which had already been supplied. The same desideratum had occurred to Mr. E. I. Carlyle as had done to ourselves, and he had compiled exactly the book which was wanted. We have now read his volume and can recommend it strongly to any of our readers whose curiosity has been excited to know more of a very notable character. They will find the work readable from beginning to end and full of interesting detail. It is also illustrated by a series of reproduced contemporary caricatures which add much to its value. They are twelve in number, and are by Gilray and John Doyle. One of them, a good specimen of the rest, we have been enabled to reproduce by the courtesy of the publishers, who have lent us the block (see p. 350). Those by Mr. Doyle contain some really excellent portraits and are executed with great delicacy of finish.

Mr. Carlyle is not a partisan, and indeed for the most part, by liberal quotations, he allows Cobbett to speak for himself. Although Cobbett's great failings are freely exposed, yet the reader is not allowed to lose sight of his high qualities of intellect, his domestic virtues, and his zeal for what seemed to him right. The chapter entitled "His Great Literary Period" strikes us as one of the best, but the whole book is good.

A Text-Book of Fungi.[1]—A knowledge of the structure and life-history of the fungi is now required of those who seek

[1] "Text-Book of Fungi, including Morphology, Physiology, Pathology, Classification, &c.," by George Massee, Principal Assistant (Cryptogams) Herbarium, Royal Botanic Gardens, Kew. Pp. 427, with 141 illustrations, mostly from drawings by the author. Published by Messrs. Duckworth and Co., Covent Garden. Cloth, 8vo, 6s.

a degree or diploma in agriculture and forestry in the universities and colleges. Mr. George Massee—who needs no introduction—has most opportunely supplied the student with exactly the book he wants.

The contents are arranged under the three headings of; (1) Morphology, Physiology, Biology, &c.; (2) Pathology; (3) Classification. The chapter on biologic forms has been contributed by Mr. E. S. Salmon. Through the courtesy of the publishers we reproduce fig. 41, showing the life-history of *Cronartium ribicolum.* There is no doubt that this text-book will be as indispensable as the same author's well-known "Text-Book of Plant Diseases."

Mr. Massee admits the impossibility, in our present state of knowledge, of giving a concise definition of this group of plants, and remarks that negative characters perhaps convey the clearest conception. "The absence of chlorophyll, and consequent necessity for organic food, coupled with the absence of true parenchymatous tissue, which is replaced by more or less compacted strands of cells or hyphæ, not organically joined laterally, constitute the most pronounced characteristics. It is important to bear in mind that the two features indicated must be in combination to constitute a fungus, as both characters are not uncommon in other groups of plants" (p. 238).

The author remarks (p. 217) that "symbiosis between fungi and flowering plants is not common, but a striking instance is recorded by Freeman as existing between certain fungi and three kinds of rye-grass respectively, *Lolium temulentum*, *L. perenne*, and *L. italicum*. In *L. temulentum*, or darnel, the life-history of the fungus is briefly as follows: The mycelium of the fungus is present in the seed; on germination this mycelium also commences growth, and keeps pace with the host plant, finally again entering the seed, where it remains in a resting condition until the seed commences to germinate, when the same cycle is repeated. A series of experiments proved that infected plants were more vigorous

than uninfected ones. So certain is the fungus of perpetuating itself by this vegetative method, without ever quitting the host plant, that the production of spores has been completely arrested. Hence there are no means of ascertaining with certainty the affinities of the fungus. In the absence of spores no other plants of the same kind can be infected, consequently there exist two races of each of the three kinds of rye-grass, one race infected with a fungus, the other race uninfected, and without a possibility of becoming infected. Microscopical examination of a commercial sample of darnel seed showed over 80 per cent. to be infected."

The extreme importance that attaches to the study of fungi may be gathered from the following statement by Mr. Massee: "It is well within the mark to state that the annual loss throughout the world due to injury caused to cultivated plants by parasitic fungi exceeds £150,000,000 sterling. Probably double this amount would be nearer the truth." Cases in support of this remarkable statement are given on p. 219. A moment's reflection will convince the reader that it is not an exaggerated one. In every village in England one sees death and destruction brought about by fungus parasites, *e.g.*, this year the potato disease has been remarkably prevalent, and some important notes upon it appeared in our September issue. It is only by acquiring a sound knowledge of the life histories of these pests that we can expect to keep them in check, and as a means to this very desirable end all nurserymen and gardeners should acquire Mr. Massee's two books.

CORRESPONDENCE.

In England, for every 100 births of girls there are 104 of boys. Male infants are, however, more difficult to rear than girls, and as age advances the proportions of the two sexes become more nearly equal, until at length there are more women than men.

The proportions of the sexes at birth is believed to differ in different races. The often repeated assertion that in negroes equality occurs is not, however, beyond dispute. It is very difficult in any excepting well-civilised races to get trustworthy statistics.

MIGRATION.—Mr. Thomas Southwell, F.Z.S., writes: "There can be no doubt that the Grey Crow is in Britain a decided migrant, rarely spending the summer months with us: I have witnessed their arrival repeatedly. The Rook, although most of our home-bred birds are to a great degree sedentary, receives large additions to its numbers in autumn, which depart in the spring, and the same may be said of the Jackdaw and Jay. Migration may be divided into migration proper, *i.e.*, when birds only spend a part of the year with us, and partial migration. In most cases, when certain species are with us the whole year, the home-bred individuals are partial migrants and move on, their places having been taken by birds of the same species from more northerly localities. In this sense there is hardly a single British bird (with the possible exceptions of the Sparrow and Green Woodpecker) which is not more or less migratory.

"Amongst the marine mammals and fishes, especially the seals and cetacea, migration is very pronounced. The subject is a most interesting one, and beset with great difficulties."

JUVENIS.—The Air contains oxygen, nitrogen, carbon dioxide, and aqueous vapour mixed together, but not otherwise combined.

All living things need oxygen, and can, under suitable conditions. receive it from the air and make use of it.

All green vegetables can take in carbon dioxide, decompose it, and retain, as needed, either the oxygen or the carbon. It is by fixing the carbon that all woody structure is produced, and many other vegetable products. Animals cannot decompose carbon dioxide, nor can fungi. Both fungi and animals are consequently dependant upon other substances for their carbon.

M.G.—The moon is constantly receding from the earth, and the distance consequently becomes greater every year.

H. K. R.—It is undoubted that the sun does not directly heat the air. The following quotation will answer your queries better than anything that we can write. "The great aerial ocean which surrounds the earth has the wonderful property of allowing the heat-rays from the sun to pass through it without being warmed by them. When the earth is heated, however, the air gets warm by contact with it, and the vapour and carbonic acid in the air are also impervious to the radiant heat given out by the earth, and are therefore warmed by radiation. But the air thus warmed is in continual motion, owing to change of density. It is lifted up and pushed aside by cooler and heavier air; and thus heat can never *accumulate* in the atmosphere, or warm it beyond a very moderate degree, so that the long-continued sun-heat of the tropics is in great part carried away to give warmth

to colder regions. Water also is mobile ; and though it receives and stores up a great deal of heat, it is for ever dispersing it over the earth. The rain, which brings down a certain portion of heat from the atmosphere or absorbs it from the earth on which it falls, flows away in streams to the ocean ; while the ocean itself, constantly impelled by the winds, forms great currents, which carry off the surplus heated water of the tropics to the temperate and even to the Polar regions. An immense quantity of sun-heat is also used up in evaporating water, and the vapour is conveyed by the aerial currents to distant countries, where, on being condensed into rain, it gives up much of this heat to the earth and atmosphere. The power of water in carrying away heat is well seen in the abnormally high temperature of arid deserts, while the still more powerful influence of air can be best understood by considering how rapidly a few hours of our northern sunshine will heat a tightly-closed glasshouse far above the temperature produced even by the vertical sun of the equator where the air is free to circulate. We can quite understand, then, that, were not a very large proportion of the sun's heat carried away from the tropics by air and water, those parts of the earth would be uninhabitable furnaces, as would indeed *any* part of the earth where the sun shone brightly throughout a summer's day."

X. L. asks : What is the difference, if any, between a spore and a cell?

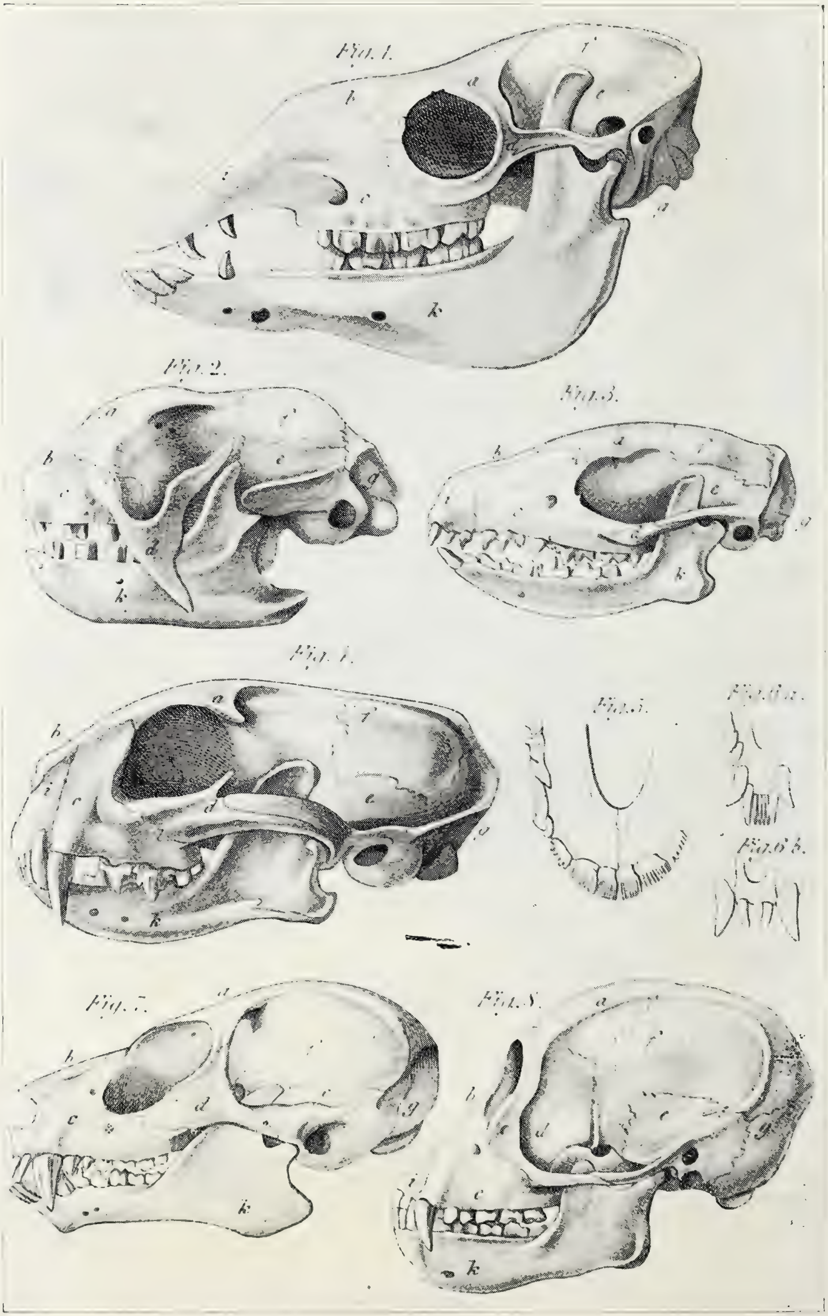
The reply must be that all spores are cells, but not all cells are spores. A spore is a cell with very special endowments. It approaches a seed in its capabilities of reproducing its kind. It is the fruiting of a fungus, and will, if the conditions are favourable, produce another fungus. It is not, however, a true seed, since no sexual combination of substances has preceded its formation, and it contains no embryo.

NYANZA.—The Bechuanas are Kaffirs, not Hottentots, or perhaps in more scientific language, they are of the Bantu family.

PRITCHARD, in his History of Man, figures a Bushman's skull, p. 312. It is decidedly dolichocephalic.

GREEK CHURCH.—H. A. W., in his article on Lapland in the *Encyclopædia Britannica*, writes : "Not to mention the advantage which the fisher has over the reindeer-keeper in connection with the many parts of the Greek Church." But really he has no advantage, for the Greek Church on its fasts forbids fish as well as flesh.

In Scandinavia the Lapps are protestants, in Russia they belong to the Greek Church. The facts have some importance in reference to the leprosy question. That disease does not prevail as a rule in the Greek Church population.



Skulls of Mammals.

THE

MUSEUM GAZETTE.

No. 9. JANUARY, 1907. Vol. I.

EDITORIAL NOTES.

We submit to our readers the appended plate (see Frontispiece), without any description, and invite those of them who incline to do so, to send us the result of their careful inspection of the various figures. The letters on the skulls are applied in each to corresponding bones. What is asked for is not a mere identification but a description of what is shown. It is not indeed necessary that the name of the animal should be given. To all who send in meritorious descriptions of the plate the offer will be made that they should select to the value of 10s. from our lists of books and specimens. It is, of course, a condition that the name of the candidate shall have been previously enrolled as a subscriber to the Gazette. A description of the plate will be given two months hence.

The curious and astonishing facts as to what is named Symbiosis which were referred to in our notes on the Potato Disease some months ago will again claim our attention shortly. They constitute one of the most important amongst many recent additions to our knowledge of the marvels of plant life. We have adduced them repeatedly in lectures, at our Museum and other places, in their relations, not only to vegetables, but also to the biology of man and other animals. One of the most interesting drawings in our collection was made some years ago in order to illustrate the fact that the presence of a parasitic fungus in certain thistles makes the affected plants grow faster than the healthy ones. By Symbiosis is meant united life; the continued and apparently

unimpaired life of one organism in which another is also flourishing. In the case of the thistle it is a fungus named *Puccinia suaveolens*. Lichens, of course, offer the most consummate example of it. In these, an alga and a fungus are indissolubly and permanently united.

Who is not interested in the attempts made to discover the cause of Cancer? Dr. Bashford, the Director of the Imperial Cancer Research Fund, London, expressed himself at the Toronto meeting of the British Medical Association to the effect that: "Experience had shown that cancer was not infectious, but was a disease of old age, appearing in both human beings and animals during the last third of their lives." Thus an apparent increase in the prevalence of cancer in any given community may mean simply that more individuals live to become old. Where the birth-rate is lowest, there cancer is most prevalent.

Dr. Bashford's avowal on this matter is of importance as coming from so high an authority, but it is no novelty. It has long been observed that of our domestic animals those which are edible very rarely suffer from cancer. Our dogs and cats, horses and asses not infrequently do so, our sheep and cattle almost never. The reason is obvious. Animals of value for the butcher are never allowed to reach the last third of their normal life period. There is definite matter of congratulation in the fact referred to. Increase in the prevalence of cancer implies for the most part increased general longevity. So far from having anything to do with race deterioration, it points in the reverse direction.

It must be admitted at the same time that the observation just recorded is somewhat discouraging as regards what is called cancer research. We cannot obviate old age. There remain, however, several directions in which, short of striking at the root of the matter much gain may be hoped. For the present, prompt extirpation, wherever possible, is the only trustworthy measure, and by it the surgeons of the past half-

century have without question obtained a large measure of victory. Much as all premature announcements of drug cures are to be deprecated, it is to be admitted that it is in that direction that hope chiefly lies. As to the nature of the disease and its prevention, it is to be feared that we know almost as much as we are likely to know.

All Biologists who feel enthusiasm for the practical application of their knowledge will rejoice in the recent decision of our Legislature to allow school children, when necessitous, to be fed at public cost. The measure, as passed, is not a very generous one, but it is a step in the right direction, and others will certainly follow. The lesson which above all the study of life-processes chiefly impresses is that results are not to be expected without adequate causes, and, next, that if causes are in existence the effects will to a certainty follow. To expect that a half-starved child will grow into a robust man, or that an inadequately nourished brain will successfully store up knowledge, is a violence to all that our zoological studies teach us, to say nothing of common-sense.

What has been the influence to which, in the main, we must attribute the development of the Chimpanzee or the Orang (which shall we take?) onward to a Mr. Birrell or a Sir H. Campbell Bannerman? The more deeply we look into the matter the more clearly shall we realise that the most influential of all the environments of humanity is the food which is supplied in early life. It was fitting, then, that our educationists and our progressives should pass into law a Food Bill for the benefit of the children of the future.

A leading newspaper commenting—in, it is to be feared, a sarcastic mood—on a resolution recently passed at a Trades Union Congress, wrote: "Briefly it is settled that the State should be asked to undertake the maintenance of school children. It is to teach them, feed them, amuse them, doctor them, and finally to extend the scholarship system so that it shall be possible for 'all children to be full-time day pupils

up to the age of sixteen.'" The biologist, however, sees nothing absurd in these proposals. He desires the results which are aimed at, and he does not expect to get them without putting into action the forces likely to produce them.

The following extract is from a Guide to "The General Contents of the British Museum" published by Messrs. Dodsley in 1762:—

"Some of my readers may be ignorant of the Manner of applying to see the Museum; for their Information I shall add, that fifteen Persons are allowed to view it in one Company; the Time allotted is two Hours; and when any Number not exceeding fifteen are inclined to see it, they must send a List of their Christian and Sir-names, Additions, and Places of Abode, to the Porter's Lodge, in order to their being entered in the Book; in a few Days the respective Tickets will be made out, specifying the Day and Hour in which they are to come, which on being sent for, are delivered. If by any Accident some of the Parties are prevented from coming, it is proper they send their Tickets back to the Lodge, as no body can be admitted with it but themselves. It is to be remarked, that the fewer Names there are in a List, the sooner they are likely to be admitted to see it."

We have ventured repeatedly to apply the terms personality and individuality to the manifestations of peculiarity occurring in trees of the same species. At p. 3 it is illustrated by one tree retaining its brown dead leaves through winter, whilst its neighbour, and probably family relative, loses them. This occurrence may be seen anywhere where oaks are abundant, and it is especially to be noticed at this time of year. Sometimes, but much less frequently, one large bough will keep its leaves longer than the rest of the tree, or will keep them green for a week or two after the rest of the tree has been unable to protect them from senile changes. This may occur when there is no reason to suspect any injury or any form of disease. It is a personal endowment of the bough concerned. That buds and their resultant twigs and boughs are to some extent personal, and may develop peculiarities which the rest of the tree does not show, has for long been well known. Darwin has had much to tell us about it.

THE CLASSICS AND MUSEUM STUDY.

Much progress has recently been made in our estimation of the place which classical studies ought to occupy in education. The old-world creed that the best method of evolving a boy's intellectual powers was to flog him until he took pains enough to be able to write verses in Latin has, of course, long passed away. It is recognised that amongst the manifold and very attractive developments of human knowledge which now claim attention, an intimate acquaintance with the details of languages no longer in use, can claim only a reasonable share. What that reasonable share may be, must be decided with due reference to the varying prospects in life of different students. We have admitted to the privileges of education large classes of the community which were formerly left out, and the needs of these have to be considered. If a knowledge of Latin and Greek was essential to the richer classes of a century ago, is it to be absolutely omitted from the training which we now give to those who in most other respects are better taught than they were? The "Grammar schools" of our forefathers are now, for the most part, merged in Board Schools, but is "grammar" to be wholly put on the shelf? What was meant by grammar formerly was, in the main, Latin grammar.

The scholars and professors of to-day, those best entitled to their opinions in the matter, are content to recognise two stages of classical attainment as being, under different conditions, desirable. The one would aim at a really sound and detailed acquaintance with the language studied, such as would qualify its possessor to speak or to write in it. The other would be content with a much lower attainment, and would be happy if its disciples were able to read and enjoy the classic authors in the original. Undoubtedly, it is one thing to read Latin and Greek and another to write in them.

Perhaps, however, after all, the two attainments are not so widely apart as they seem. The man whose knowledge stopped short at what was called reading might be very prone to make mistakes even in that. It might be better for him to read Homer in Chapman's translation, as he is already content to enjoy his Old Testament without knowing much of Hebrew. In passing, it may be here remarked that the excellence of the translations now so easily accessible is an important feature in the changed aspect of modern education in reference to the classics. On all hands it is to be admitted that there are truths—modes of thought and forms of opinion—enshrined in the writings of the Greeks and Romans—of which no more than of the History of the nations themselves—ought any pupil to be left in ignorance. Our conclusion regarding them is, however, clearly this—that they may be acquired as well, in many respects probably better, by the use of scholarly translations than by laborious recourse to the originals.

There is, however, a yet lower stage of attainment in the classics—if it even deserves such a name at all—to which we now desire to call attention. Its plea would be based upon a belief that some elementary general acquaintance with the Greek and Latin languages is very helpful, nay, almost essential, to the English student, and that opportunities for its acquisition ought to be carefully afforded to all. It is not possible to read any English poem, novel, history, or newspaper leader, without encountering allusions which are unintelligible to one wholly ignorant of classical literature. In science and natural study most of the more important words and terms are derived from those languages, and are only half understood, or not at all, by those uninstructed in them. When explained, they still remain for such persons a burden to the memory, whilst to linguists their meanings are quite obvious.

What, then, should be the scheme of education, which should include this elementary acquaintance with the classics,

which as a minimum is to be coveted for all? We will summon courage, and venture, somewhat perhaps *ultra crepidam*, to sketch it. The child should be made familiar with the contour of Europe and the Mediterranean, with the boot of Italy and the mulberry leaf of Greece. The Greek stories of Hack and Kingsley, and the best parts of Plutarch's Lives and Herodotus' Travels, should have been the pleasures of his leisure hours. He should have been made to comprehend that a century is a hundred years, and that these would comprise the lives of three generations—his father's, his grandfather's and his own. He will then have realised that different peoples express themselves in different words, and also that there were times in which there were no cannon or guns, no printed books, and in which Christianity had not yet been heard of. At this stage of his attainments he should have been taken through the well-arranged space-for-time History Gallery of an Educational Museum. He will there have learned that Egyptian civilisation long preceded that of Greece, and that the Greeks attained it before the Romans. The relation of that of Rome to the time of Christ will have been impressed upon his memory by observing that the bust of Cæsar stands just before well-known symbols of the Crucifixion. He will have seen fragments of Roman pavements, engravings of Grecian temples, real Roman horseshoes, abundance of Roman glass, Roman coins and weapons. He will have been interested in the information that the museum does not contain a Roman stirrup, for the simple reason that the Roman horseman rode without them. Portraits and busts reminding him of the stories which he formerly listened to will have been shown him, and with a certain number of their names he will have become fairly familiar. His attention will have been drawn to inscriptions on altars and on coins, and it will now be strange if his appetite be not whetted for some acquaintance with the languages which those people spoke.

At this stage let the young scholar be enlightened to see

that the names of things are simply certain arrangements of letters by which the things are known, and that it is just as natural to some people to call a four-legged milk-giving animal vacca or capra, as the case may be, as cow or goat. Neither the one nor the other name signifies special learning, but for those who wish to interchange opinions it may become necessary to know both, and to know that they mean the same thing. It will now be very easy to point out that in the language used in the playground and shop there are many words which were not known to our immediate ancestors, but are founded on those which the Romans used, and further, that the Romans themselves borrowed much from the Greeks. It may even be hinted that in the past it is quite possible that some of our ancestors were not Anglo-Saxons, but used at their dinner tables the very words which we now have to learn at school. Not even to the dullest will it be necessary to explain that in order to use words without blundering it is desirable to know what they mean, but it may with advantage be made clear that the further the student advances the greater will be the number of words he will encounter which do not explain themselves unless he knows their Latin equivalents. The teacher's task is now clear. Lists of important root-words should be prepared which should be committed to memory, and by well-devised expedients should be made so familiar that they are always available. There could be no better exercise, perhaps, than the perusal of some scientific catalogue, say of butterflies or birds.

We must not venture into further detail, for it would take us too far, and be for the present object out of place. Our purpose is, to urge that a standard of educational attainment for the million should be aimed at, which should include a sound but elementary acquaintance with the history of the older nations, and as a matter of memory, an extensive knowledge of their vocabularies. Such education would make no pretence of being in any sense classical, nor would

it deal with the languages as a means of developing the mind. It would regard these rather as necessary aids in the pursuit of other knowledge, from which such training would not be omitted.

HOW HOLLOW TREES ARE PRODUCED.

Scattered over the country, one here, and one there, in not a few places, there occur hollow trees of great age. They are almost always oaks, but in some instances, and especially on the Continent, they may be chestnuts. There is always a doorway of entrance and the space inside is often sufficient to accommodate several persons. They are lined with dry and dead wood, but their exterior is still living and produces every summer its growth of new shoots. They are the favourite resort of the children of the neighbourhood, who use them as huts.

There has hitherto been much mystery as to how these hollow trees have been formed. Nothing is less probable than that the heart-wood of a large oak should undergo decay whilst its outside remained sound. Even if that were conceivable, how explain the breaking through on one side to form the doorway? There need, we think, be no longer any difficulty in the matter. The facts which we have recorded at p. 204 give us the explanation. The conditions are consequent upon the tree having been struck by lightning when comparatively young. The effect of this would be to kill the middle parts of the bole and to tear through the bark on one side. After this the trunk would slowly break up and in the course of years would be removed. Meanwhile, fresh layers of wood would be laid on outside and the tree would grow in girth. On the side where the bark had been torn up the doorway would remain. We have but to suppose a long series of years and the whole would be achieved.

MUSEUM STATISTICS.

The Museums Association has, in the *Museums Journal*, under the able editorship of Mr. E. Howarth, recently completed a "Directory of Museums and Art Galleries in the United Kingdom." From it we glean the following items :—

In the first place we may note that the following have not been included :—

The Charterhouse Museum at Godalming.

The Booth Museum near Brighton.

Queen's College Museum, Belfast.

Municipal Technical Instruction Museum, Belfast.

The Guildhall Museum, Londonderry.

Archæology Museum, Shepton Mallett, Somerset.

The Museum at Wells, Somerset.

The Museum of the Carmelite Monastery, Wincanton.

The Museums at Peterhead, Radcliffe and Whittingham.

Having supplied the above-mentioned omissions, there are 330 museums and art galleries in Great Britain and Ireland situated in 225 cities, towns or villages. Forty-six (more than one-seventh) are in the Metropolis.

Edinburgh and Cambridge each have seven, Oxford six, and Belfast, Liverpool, Manchester, Sheffield and Dublin each possess four museums and art galleries. These statistics include the pathological museums in various hospitals.

There are only eighteen museums exclusively devoted to art.

Twenty-one museums have an income of less than £50.

The following towns (twenty-four) possess but the nucleus of a museum, one or two small rooms with few exhibits : Croydon, Dunstable, Chelmsford, Eastbourne, Grimsby, Harrogate, Hertford, Hove, King's Lynn, Kingston-upon-Thames, Kinross, Louth, Lincoln, Llanidloes, Llandudno, Luton, Merthyr, Monmouth, Tunbridge Wells, Ripon, Ryde, Shipley, Stroud and Worthing.

There are, exclusive of the great National Museums, but three which, according to the Directory, are visited by half a million or more people annually, viz.:—

Glasgow Art Gallery, 1,440,000.

Birmingham Museum, 750,000.

People's Palace at Glasgow, 500,000.

The number of visitors to the Free Public Museums at Liverpool was 498,000 in 1903; it is probably in excess of half a million now. It should also be noted that the Whitechapel Art Gallery during the seventeen weeks it was open in 1903 was visited by 360,000 people.

Twenty-seven museums, other than the National Museums, have an average attendance in excess of 100,000, and less than 500,000, whilst twenty-two register an attendance in excess of 50,000, but less than 100,000.

It is probable that some of the statistics are not to be relied upon, but at Birmingham (700,000 to 800,000), Bradford (360,000), and Bolton (275,000), the attendances are registered by turnstiles.

The three museums at Glasgow, viz., the Art Gallery, the People's Palace, and the Camphill Gallery are together visited annually by more than two millions!

The Belfast Museum of Natural History, belonging to the Belfast Natural History and Philosophical Society, is visited by 4,000 to 5,000 people yearly. Its collections illustrate for the most part local natural history, ethnology, and archæology.

The Belfast Corporation Art Gallery and Museum, containing pictures, minerals, shells, glass, pottery, &c., and Irish prehistoric antiquities, is visited by about 350,000 people annually.

At Chester the visitors are about 10,000 to 12,000 annually. "The visits of students amount to 100,000."

At Ilkley a separate register has apparently been kept of local attendances. It is stated in 1902 that 3,999 people visited the museum, "of these 593 were local people."

The following items are not cheering:—

Under income and working expenses of one museum (Derby), it is simply recorded, "Annual deficit £300 to £400."

At Largo: "There is a small museum in connection with a local Natural History Society, but the collections are neglected."

The number of visitors to the Linlithgow Museum is stated to be twenty annually!

At Guildford (Surrey's capital), the Archæological Museum is visited by about 400 people annually.

As to Frome, we read that the number of visitors is "practically *nil*," and it is equally melancholy to read that "the Museum has no separate income, and nothing has been spent on it for several years."

There are at the present time at least fifteen towns in Great Britain with a population in excess of 50,000, yet without museum or art gallery of any kind. Amongst these may be mentioned Birkenhead, Rhondda, Gateshead, Bournemouth, Coventry, Wigan, and Greenock.

Our Gazette keeps before it two main objects, the first being to convince Municipal bodies and others that Educational Museums are essential to educational progress, and ought to be provided in every town of any considerable size. Our second object is to explain how best the formation of such Museums may be attempted, and to give such aid as we can to their realisation. The statistics given above reveal a state of things which abundantly justifies our effort. Leaving aside the Metropolitan cities, the Museums of the United Kingdom appear to be dotted about like plums in an impoverished bun on the "here am I, where art thou?" principle, few and far between, and without any regard to the local requirements. Wigan, with its population of 60,000, has no Museum, whilst Ilkley, with only 7,000 not only has one, but boasts an attendance of 4,000 annually. Nothing can be more obvious than that local zeal rather than local need has been the chief influence in determining the location of Museums. There is as yet no general recognition that Museums are a necessity, and their formation a duty which is laid upon the educated classes, and more especially upon those in civic authority.

It is obvious that some of the Museums named in the

foregoing list exist in little more than name, and that their claim to attract visitors is but small. The statistics of attendances at others must be taken with caution. They are by no means always comparable with one another. Not only do the modes of counting vary, but the kinds of attraction offered differ very much. Glasgow has been foremost in the provision of legitimate Museum attractions, but the splendid totals of attendances which her turntables record are, we believe, to be discounted by the fact that they have been liberally supplemented by the introduction of excellent music. They may almost rank as concert-rooms as well as museums.

It is, we fear, more than possible that a majority of the Museums named make but little pretension to being considered educational. They are of the old type—collections of unclassified curiosities, without catalogues and for the most part without labels. Such cannot, in the present day, be expected to attract many visitors. We shall probably revert to this topic before long. It is, indeed, our perennial theme.

Can we Eat Air?—That in order to live we must breathe the air is well known. In breathing we take from the air its oxygen, but we leave, as not being able to use it, by far its larger constituent, nitrogen. Hopes are now raised that we shall be able artificially to make this nitrogen eatable. The process is a little roundabout, but none the less definite. The air is to be resolved into its constituents and the nitrogen forced to combine with lime. The resulting compound is invaluable as a manure-food for wheat and other cereals, and thus becomes a constituent of flour. These, stated briefly, are the chief facts concerning a discovery now in process of being realised, by which we shall be enabled to literally live on air. Should it succeed the production of the most valuable food may be increased enormously. It is needless to point out that the achievement is not a novelty in plant life as regards Nature's laboratory.

THE TOOLS OF OUR ANCESTORS.

It is but very seldom in the investigation of the facts, either as regards natural history or human history, that we can begin at the beginning, but it is always well to let the imagination, under careful guidance, travel back as far as it can. This is emphatically the case in reference to the tools used by our remote ancestors. Man has been defined as a tool-using animal, and, no doubt, an aptitude in the employment of implements constitutes one of the most conspicuous differences between man and the most highly developed of non-human animals. It requires, however, but very little thought to see that it is an arbitrary one, and that it cannot be insisted on. In citing it we have not got at the real beginning. Evidences of intelligent contrivance very closely approaching the use of tools are abundant in many departments of animal life, whilst a certain number of instances of the actual employment of them may with diligence be discovered.

In our speculations as to the stages of progress onward from the anthropoid ape to the period which history deals with, the imagination has an immense duration of time in which to disport itself. Facts make it convincingly certain that men, as defined by the ability to make and use tools, have existed on the earth, and in lands now a part of England, for a quarter of a million of years. His tools in the form of manufactured stones have been unearthed, which in all probability date as far back as the time we have suggested. No doubt, however, even at that period he had got a fairly large brain, had smoothed down his orbital ridges, rounded his forehead, developed a nose and thrown forward his chin. To what extent his tool-house and his workshop were supplied we can never know. We may be almost sure that the very earliest of his implements were of wood and little more

than clubs. Coeval probably with these would be stones, not wrought or fractured in any way, but chosen on account of peculiarity of shape. Where flint was obtainable it would be the most attractive. On wood and stone there might soon follow bone and horn, and some makeshift for cordage prepared from bark or grass. Of the substances mentioned, all except the stones are perishable, and thus it has come about that scarcely a vestige of primæval contrivances remains to us except the tools of stone.

Our school children are now as familiar with the Stone Age as they are with that of Julius Cæsar, and are instructed to place stone, bronze and iron in their proper order. So far so good, but it is to be feared that but little attempt has been made by most of us to familiarise our minds with the enormous duration of the first of these ages as compared with those which followed it. An attempt to display these periods in schedule form excites in the minds even of those amongst us fairly well accustomed to such considerations, a feeling of sceptical amazement. Yet it is absolutely necessary that we should make some effort towards a realisation by the imagination of these facts if we would deal faithfully with them. Not even the rudest palæolithic flint was a primitive tool, others still less recondite had preceded it and had perhaps been in use for many ages before it was evolved. These considerations have been suggested in reference to the comparatively novel observations on what have been termed eolithic flints. These stones are rude to the last degree and show little indeed which can be claimed as evidence of man's hand upon them. Yet they have peculiarities which must claim attention, and it is therefore appropriate to remind ourselves that there must have been preliminary stages even in the art of flint-chipping.

Most of our Museums now contain series of specimens of these flints—collected usually by the zeal of Mr. B. Harrison, of Ightham, on the Kent plateaux. We need not therefore stop to describe them. They must be seen and handled.

Their genuineness was the subject of an important discussion at the International Congress of Anthropology and Prehistoric Archæology. It is stated in *Nature* (June 28), that "a series of mill modelled flint nodules was exhibited, among which there was certainly a number closely resembling many Prestwichian types, but conspicuous by their absence were the decidedly purposeful and rationally usable Kentian forms. A small collection exhibited by Prof. Girod, obtained near Aurilliac, affirmed to be out of a bed of Tortonian (Miocene) gravels containing Hipparion, underlying a massive stratum of basalt, contained at least one 'eolith' unquestionably of human manufacture. The occurrence was vouched for, by M. Rutot, of implements of a particular silex, identical in form with those from Kent, in pre-Glacial beds in Belgium, in which no other silex pebbles of the same character and composition were present, and the manufacture and introduction of which could be due only to man. Prof. Ray Lankester submitted that he had recently placed on exhibition in the British Museum a considerable series of specimens selected from Prestwich's collection, all borer-like in form, too identical in shape and so obviously of rational utility for any possibility of their being the result of fortuitous natural collisions. The congress was, however, divided in opinion on the subject. At a later meeting a telegram from Prof. Schweinfurth, in Egypt, was read, announcing full confirmatory evidence of the occurrence of 'eoliths' in the Nile Valley."

Pigmy Flints.

Pigmy Flints constitute a class of flint implements which are very remarkable for their diminutive size. They seldom exceed an inch in length, and are often not more than half an inch. In spite of their small size, the thicker sides or backs often show very beautiful secondary chipping, but the natural edge is usually left untouched. It requires a careful examination of a "pigmy flint," with the aid of a pocket lens, properly

to appreciate the immense amount of skill and patience which must have been expended in their manufacture. They have been found in many localities in this country. Messrs. Johnson and Wright, in their book on "Neolithic Man in North-east Surrey," write: "Our Surrey specimens are limited to one from Netley Heath, one from Richmond Park, two from Leith Hill, and another from Headley; these with some probable ones recorded from Lockner Holt, near Chilworth, appear to complete the county's record." Quite recently, Mr. Allen Chandler, J.P., a well-known collector of flint implements in the Haslemere district, has succeeded in obtaining a remarkably fine series of these flints, from a site which appears to have been that of a neolithic flint implement factory on Blackdown, a hill nearly one thousand feet high, about a mile from Haslemere town, and just over the Sussex border. Specimens from this site may be seen in our Museum. Any collector may, with little trouble, secure a series for himself, if he can alight upon the spot, which, however, is not very easy to find, Blackdown being for the most part an open moor several hundred acres in area, covered with gorse, heather and bracken. We intend to give an illustration of some of these flints later on. These curious implements occur in many countries. They have been recorded from caves of the Vindhya Hills of India, from Palestine, Egypt, North Africa, the South of Spain, France and Belgium. The form is remarkably persistent in all these countries, so much so that it has been supposed they are the work of a diminutive race of men; but we might just as well argue that the beautiful barbed arrowheads which occur all over the world are the work of a single race. There can be little doubt that some of these tiny flints were used as arrow points, others as awls and drills. Some may have been used to bore holes in shells, for shell discs have been found in direct association with pigmy flints in South Spain. A large series of "pigmies" from various countries may be seen in the British Museum.

COLOUR-CHANGES IN LEAVES.

THE following list is supplementary to our article on "Autumn Leaves" which appeared in last month's Gazette The descriptions apply to some of the specimens which constituted, during November, a special and temporary collection in the Haslemere Museum. Many of the specimens have been preserved, but fresh ones are always preferable, and our list is intended for use with a future and more extended collection. We hope also that it may be found useful in other institutions where next autumn it may be thought worth while to arrange similar exhibitions. There are few more attractive subjects for careful observation during the duller months of late autumn than those which concern the very varied causes of the changes in colour shown by leaves.

The observer should begin by noting the arrangement of the colour changes. Are they alike on the two halves of the leaf? Do they begin at the top and borders? Do they assume any special pattern? Is there, apart from mere change in tint, any other peculiarity to be noted?

We have classified our material under several heads :—

(1) Changes due to age.

(2) Changes influenced by the presence of insects.

(3) Changes influenced by the presence of fungal parasites.

(4) Changes influenced by accidental damage.

It must be understood that in most cases these influences complicate each other, and that in all the effect of sunlight is presupposed as the final cause of colour.

GROUP I.—CHANGES INDUCED BY SENILITY (AND SUNLIGHT).

OAK (*Quercus robur*).

The colour-changes of senility always exhibit bilateral symmetry. If, as is often seen in oak leaves, there is an absence of symmetry, it may be concluded that the changes were influenced by some external cause, even if such may not be very evident. In the leaves here exhibited the symmetrical markings indicate acroteric (senile) death, the non-symmetrical

ones probably resulted from the attack of a gall-fly, though the resultant gall may have fallen off. For the purposes of comparison, leaves of the Turkey oak and other alien species exhibiting brilliant autumnal tints are placed here.

BEECH (*Fagus sylvatica*).

The leaves of the beech pass through various colour changes from pale yellow to dark reddish-brown. The change is a symmetrical one, the yellow tint first appears at the margins and tip of the leaf and gradually spreads until the mid-rib is reached.

PEAR (*Pyrus communis*).

There are numerous cultivated forms, and similar colour changes are observable in the leaves of all. They are at first yellow with brownish patches, then red or reddish-yellow with dark blotches, finally dark brown. The under-surface never assumes a red tint.

HAZEL (*Corylus avellana*).

The leaves are bright yellow at first, later they are either mottled with brown or that tint on the margin in a symmetrical arrangement. The change from yellow to brown is usually a quick one. In some cases the leaves quickly assume a dark brown tint.

BRAMBLE (*Rubus*, many species).

The bramble is practically an evergreen. A few leaves turn yellow and fall at intervals throughout the year, such are here exhibited. (For spotted leaves see another frame.)

GOAT WILLOW (*Salix caprea*).

The leaves are mottled with green, red and black. They never become uniformly red or black, and the lower surface always remains of a greyish-green hue.

WHITE BEAM (*Pyrus aria*).

The leaves assume a yellowish-brown tint with beautiful dark brown marginal markings arranged quite symmetrically. The brown gradually spreads over the entire leaf. The lower surface always remains of an uniform greyish tint.

SYCAMORE (*Acer pseudo-platanus*).

First changing to yellow, then brown. In its ally the common maple (*A. campestre*) the golden yellow tint is very pronounced and more quickly assumed. (For markings induced by parasitic fungi see other frames).

GROUP II.—CHANGES INDUCED BY INSECT PARASITES.

(1) LEAF MINERS.

HOLLY (*Ilex aquifolium*).

Holly leaves mined by the larva of a minute fly (*Chromatomyia ilicis*) which burrows beneath the upper cuticle and causes the familiar reddish blotches. The corresponding lower surface bears a very slight yellow discoloration. Apparently no harm results to bushes attacked by this fly.

OAK.

Oak leaves mined by the larvæ of a species of *Lithocolletis* (a genus of leaf-mining moths) causing more or less oval whitish spots on both surfaces. All members of the genus make very similar mines in leaves of various trees and pupate in them. Bees and beetles (infrequently) and flies also mine leaves.

BRAMBLE.

Bramble leaves mined by the larvæ of *Nepticula aurella*, a minute golden-brown moth. The burrow begins as a mere thread and widens as the grub increases in size. Commonly seen on leaves of young brambles. The leaf is usually reddish around the burrow.

BEECH.

Beech leaves which have assumed the brown tint of autumn but retain isolated patches of green. Each patch is occupied by a living larva or pupa. In the upper series may be seen the hairy tubular galls of *Hermomia peligera*, a minute fly. Below are the mines of two small moths; on the left the serpentine burrow of *Nepticula titigvella*, on the right the oval mine on the underside of the leaf of *Lithocelletis faginella*.

Oak.

Oak leaves with the small button-like galls of *Neuroterus lenticularis* (a small fly) on veins on the under-surface. By absorbing the sap these galls have caused the death of the leaf above them. The galls have fallen away from some leaves, but the absence of bilateral symmetry in the brown markings clearly indicates that the decay is not induced by senility.

Oak.

Oak leaves for the most part withered and brown, but retaining green patches here and there. A gall of *Neuroterus fumipennis* occupies (on the lower surface of the leaf) the centre of each patch of green. (Compare with beech leaves showing similar chlorophyll patches.)

Group III.—CHANGES INDUCED BY FUNGUS PARASITES.

Bramble.

Bramble leaves attacked by a rust fungus, *Phragmidium bulbosum.* (*a*) Upper surface with bright red spots. The leaf does not show autumnal colouring. (*b*) Under-surface of the same leaf, with corresponding spots; these are purple red, and the dark centre of each is a ripe spore mass. (*c*) Leaf showing senile colour changes, together with the red spots induced by the parasite.

Dogwood.

Leaves of dogwood (*Cornus sanguinea*) with purplish spots induced by a parasitic fungus, *Phyllosticta cornicola.* Similar markings occur on Viburnum leaves. It is not an uncommon fungus. Other species of *Phyllosticta* attack living leaves of fruit trees, and of celery.

Sycamore.

Sycamore leaves with large black spots caused by the fungus *Rhytisma acerinum*, a very common parasite. The spores rest over the winter and attack the young leaves in

spring. (*a*) Leaf with fungus spots, but without autumnal colour changes. (*b*) Leaf with fungus markings, also autumnal colouring caused by excess of oxygen. The fungus causes early death and fall of the leaf. It also occurs on maple, and various species of *Acer* in other countries.

Sycamore.

Sycamore leaves with the characteristic yellow tint assumed in old age, but retaining here and there bright green spots and patches on the upper surface, with greyish patches on the corresponding lower surface. These markings are induced by the fungus *Botrytis deprædens*.

Black Currant.

Autumnal colour-changes in leaves of the black currant. On the lower surface may be seen the fungus known as *Cronartium ribicola*. It is the winter state of the Weymouth-pine fungus (*Peridermium strobi*) apparently it causes brighter red tints than are usually observable in non-infected leaves.

Elm.

The leaves turn yellow and become brown after they have fallen. The black spots so frequently seen on the yellow leaves are the undeveloped form of the fungus *Dothidea ulmi*.

Group IV.—CHANGES INDUCED BY ACCIDENTAL CAUSES.

Bramble.

Bramble leaves with spots superficially resembling those induced by micro-fungi. The markings here depicted were caused by sparks falling upon the leaves from a fire on Weydown, Haslemere, in April, 1901. Lens-like thickenings in the glass of greenhouses will sometimes focus the sun's rays upon leaves, and cause yellow or brown spots. The action is that of a burning-glass, and if very intense the spots may become black.

Oak.

Retention of leaves by fallen oak branches. This clearly demonstrates that the fall of the leaf in autumn is a vital process. The twig from a fallen branch here exhibited retains its leaves, these have become withered and brown. They are tightly fixed. Note that the leaves have also retained their spangle galls.

Mahonia aquifolium.

Discoloration of leaves of mahonia the result of injury. These leaves turn a brilliant red colour above all injured parts. They demonstrate very clearly the general principle that changes of colour as well as actual death of parts depend upon interference with the sap circulation, and may be localised by anything which interferes with the mid-rib or veins in which the sap channels run.

Oak.

Large oak leaves which have retained their normal green colour until late autumn. They are from shoots which grew from the stool left by the felling of a tree. The tops of the shoots had been cut back in the summer. The explanation of their giantism and freshness is that they have fed in excess.

MELLEUS GROWING ON A DEAD TREE.

Let the reader picture to himself an oak tree about as thick as a man's thigh. It is dead, but there is nothing to show this in its bole for the bark looks sound. It is overshadowed by bigger trees which have probably caused its death. There is no trace of injury or decay at its base and no fungus grows there. Higher up, however, at distances of a foot or more from each other there are five or six clumps of a fungus which in its present blackened state of decay (it is December 24) might be taken for a common mushroom, being about that size and having gills. The clumps are as big as fists, ranging from that of a child to those of a man. They are all on the south-

west side of the tree and are placed almost in line one above the other. With this preliminary we introduce the following discussion between a Ramble-class and their leader.

We have brought you here, Professor, in order to seek from you further information as to this tree and the fungus which is growing from it. As you see, it is an oak and it has not long been dead. What we want to show you are some large growths of a gilled fungus which have sprouted out from its bole, some of them eight feet from the ground. We rather expect that you will say that it is our old friend the common *Melleus;* but is it not unusual to see *melleus* so high up and growing from a stem with the bark still on?

PROFESSOR: You are right, that is *melleus*, for although it has lost its colour by decay its characters may still be determined. I agree with you that it is very unusual to see it growing so high up, and especially so on an oak.

Thank you. Our next question is as to whether these sporophores, for so we suppose we ought to call them, are grown from mycelium ("spawn") present in the wood, or are they due to fresh spores locally implanted on the bark by the wind? We especially ask your attention to the fact that they appear to sprout out from bark which is unbroken.

PROFESSOR: *Melleus* has a great power of producing long wire-like roots which spread great distances in the ground and attack decaying wood wherever they find it. Once in the wood they climb up in its substance and flower out on the surface wherever it seems suitable. That doubtless is what has occurred here. What I have called wire-like roots you may call rhizomorphs.

Do you suppose that the fungus gained access to the tree whilst it was living and has been the cause of its death?

PROFESSOR: I should think it killed the tree. *Melleus* is a very destructive fungus and may destroy a whole orchard.

Do you feel quite sure that you are putting the case correctly? May it not be the fact that the apple trees became

liable to its attacks because they were sickly? We had supposed that *melleus* grew only on dead or dying stumps. Is it really a fact that it attacks living and healthy trees, and if so why do not many more trees suffer? We have none of us ever before seen this fungus flowering out high up on the stem of a healthy tree. In the present instance no other tree in the wood except this dead one shows it. We have searched the wood carefully.

PROFESSOR: I admit there is much in what you say. Many fungals live neither on living trees nor on rotten trees, but on those which have only recently died and which still have in their substance the remains of sap. Like connoisseurs in game, their prey must be dead and on the verge perhaps of decomposition, but not absolutely rotten. Some of them, I fear, do not wait till death is quite complete and of them very probably *melleus* is one. *Stereum hirsutum* is certainly one. You may remember the fine demonstration of this which you found for me on an oak in this very wood two years ago. It flourished on a bough not long dead, and now the fungus itself is dead also.

Might we say that these fungi live as long as there is any food which they can eat, and die when the store is exhausted? They cannot, like the fungals of the fairy rings, migrate outwards in ever-enlarging circles, for the tree boughs do not give them room.

PROFESSOR: That would probably be very near the truth.

We are really very much obliged to you and we hope you will not think us impertinent if we ask you to show us *melleus* growing on a living tree. Some of us had heard you say in a former walk that it is a dangerous fungus, and we looked it up in Berkeley and found that he says simply "on dead stumps," nor can we find it on any other.

PROFESSOR: I am only too glad that you have had sufficient zeal to look into the matter. You will find in the end that I am right. It is a most interesting question as to how it has got to this tree. If it has obtained access by the roots it

would appear that its rhizomorphs must be almost ubiquitous, for there is no trace of it elsewhere. Against the belief that its spores have been wind-blown is the fact that none of the dead or dying branches, of which there are plenty on the neighbouring trees, have been attacked. That fact, you must admit, points to its having killed the tree, for how if the tree first died could *melleus* have found it out ?

We admit the inference, but we still beg to ask why are not the other trees attacked ?

PROFESSOR : Perhaps they will be some time.

OUR PORTRAIT GALLERY.

WE gave as the Frontispiece to our last Gazette a fine portrait of Erasmus from a print not often reproduced. The one more usually copied is that which we now supply. Making allowance for difference in head-dress and for the presence of a flowing beard in the one and its absence in the other, it may be said that the features are the same. There is the same arched nose, the same eyebrows, and the same lower lip. The mouth is, however, smaller in the frontispiece portrait than in the other. Both represent a man past middle age, the latter of a decidedly old man. In both the features reveal Jewish descent, and it is known that one at least of Erasmus' parents was of that race. In him we may claim another example of the advantages of mixed blood. Erasmus was not only a man of rare attainments and most extensive culture, but possessed a force of intellect and clearness of insight which constituted genius. He was a lover of knowledge for its own sake, for he knew its value to humanity. Free from the prejudices alike of nationality and of superstition, he attained a wide outlook on the destinies of the human family. This kind of unimpassioned grasp of realities and ability to value them at their true worth is, it may be suggested, rarely gained, excepting by those who are

descended more or less directly from one of the races in which culture has been hereditary through long ages.

The present portrait is from a block kindly loaned to us by the Religious Tract Society, and is taken from Beza's Icones. (See Review notice at p. 416.)

OUR LEXICON PAGE—EXPLANATION OF SCIENTIFIC TERMS.

(*Continued from p.* 359.)

Icon.—This word, borrowed from the Greek, means simply an image or portrait, or representation. In natural history Icones (Latin plural) are pictorial representations of butterflies, birds, &c. In Art and History they are collections of portraits (*e.g.*, Beza's Icones, reviewed at p. 416). In Religion they are little images or pictures used in public or family worship, or carried about the person. The word is still in ordinary use in Russia and by the Greek Church. In England it has been supplanted by the word Image. It still survives, however, in the word "Iconoclast," a "breaker of Images," and several others.

Catkin.—This word is of Anglo-Saxon derivation and means literally a small cat. It has been applied to certain flower-forms which are supposed to resemble cats' tails. The term lambkins might be more appropriate, for catkins more usually hang down, and more nearly resemble in form the tail of a lamb than that of a cat. The stamen-bearing flower of the hazel supplies a good example of a catkin, but catkins are produced also by the willow, oak, birch, poplar, and some other trees. As a rule it is the male flowers only which assume the catkin arrangement. The florets, which consist of scales and have no true petals, are placed around a slender central thread so as to form a cylinder. Many catkins remain for months in the bud stage, but finally they open and shed their pollen. The "palms" of the willow with their abundant yellow pollen are catkins.

Amentum.—This Latin word, which signifies a thong or lash, is used in botany as equivalent to catkin. The catkin-bearing trees were formly grouped together as *Amentaceæ*.

Cavicorn, having hollow horns, as in cattle, sheep, &c. Of Latin derivation from *cornu*, a horn, and *cavus*, hollow.

Pecora, cattle, from Latin *pecus*. In zoology the term pecora is applied to the true ruminants, an exceedingly well-defined group of mammalia. In this sense antelopes, goats, deer and sheep are pecora, or cattle, as well as cows, but not camels or horses.

Cervidæ, a family of pecora or ruminants, which comprises the deer and all antler-bearing animals. From Latin *cervus*, a stag.

Ornithorhynchus, or bird-nosed, is the name of an Australian animal which has a snout like the bill of a duck, webbed feet, no teeth when adult, and which lays eggs. It is also known as the Duck-billed Platypus, or for brevity "the Duck-bill."

Platypus means broad-footed, and is especially applied to the Ornithorhynchus, which has not only webs between its digits, but has its digits widely apart, and on its front feet at least a web, which extends much in advance of the ends of its claws.

Digits are "fingers" in the broadest sense of the word, including toes, and all other modifications of the five terminal divisions of the limbs. They are never more than five, and often less (by suppression).

Digitate, divided, after the manner of fingers or toes.

Suppression.—Whenever a structure or part of an organ which has been present in a progenitor is left out or greatly dwarfed in subsequent generations, it is said to have been suppressed. Examples of suppression abound both in plants and animals, and usually result either from long-continued disuse or the competition of some other structure yet more important.

(*To be continued.*)

NATURAL HISTORY NOTES AND EXTRACTS.

Museum of Forestry in the Forest of Dean.

In the Report of the Commissioners of Woods and Forests in the Forest of Dean, 1905-1906, it is stated that during the past year a museum has been built at Parkend. It contains a large series of specimens of various timbers, and others showing damage caused by animals, insects, fungi, &c. The specimens are being arranged and labelled, and when this is done they should prove of the greatest value and interest to the forest student.

Fleas and Plague.

It has been definitely established by the Indian Government Plague Commission that the plague is usually carried from rat to rat, and from rat to man, by the rat flea (*Pulex cheopsis*). By a series of experiments it was shown that plague-infected rats known to be without fleas did not convey the disease to healthy ones; but if fleas were admitted to the colony, the rate of progress of the epidemic, once started, was in direct proportion to their numbers.

Guinea-pigs isolated in gauze-covered cages to keep out the fleas were placed in a plague-house, but they did not contract plague. In several cases, however, guinea-pigs placed in a plague-house in cages where the fleas could reach them, contracted plague; microscopic examination of some of these fleas revealed the presence of the plague bacillus in the intestines.

A Nest of White Blackbirds.

The following note is taken from *Science Gossip*, 1902, p. 191: "Ornithologists will be interested in the fact that Mr. Charles Wood, chemist, Harleston, Suffolk, has in his possession a nest of white blackbirds (two cocks and one hen bird), which he purchased from a labourer. The nest was in a lane not half a mile from Mr. Wood's premises. The trio have now

been out of the nest three weeks and are healthy and lively; they are perfectly white, with pink eyes and yellow beaks."

Birds in Mid-winter.

"Sand is as necessary as food in snowy weather, for a bird with an empty gizzard cannot digest its food. Birds endure great hardships when the ground is covered with snow for many days together, but I fancy that they care little for mere cold. Such as are fond of bathing will bathe in an ice-cold spring on a frosty morning, and you will rarely find a bird of any kind seeking shelter from a cutting north-east wind. Rain is a different thing, many birds do not like to get their plumage wet. There is sometimes talk of birds perishing from cold, but it will generally be found by close enquiry into the circumstances, that they were short of food and water when they succumbed" (Miall in "Round the Year").

Ancient British Monuments.

In *Nature*, December 13, appeared the first of a series of illustrated "Notes on Ancient British Monuments," from the pen of Sir Norman Lockyer. It deals with the Aberdeen circles, and takes the form of a letter to Dr. Angus Fraser. We await number two with pleasurable expectation.

The Bleaching of Bark.

The following observation was made in a plantation of sweet chestnut which had been cut down three years ago. The stoles had the luxuriant new growth of three summers, for it was now again winter. Attention was attracted to one stole which differed from all the rest. The peculiarity was that its shoots, most of them four feet high or longer, were green and healthy looking in their upper parts, but of a light yellow-white colour for eighteen inches length from the stole, that is, at their oldest and thickest parts. The first suggestion was that they had been cleanly barked by rabbits, but against this came the consideration that rabbits will not attack chestnuts; and if they did why should they bark every

shoot of this stole and leave all the others alone? On closer inspection it was found that the shoots were not barked but simply blanched. Their bark was quite whole and smooth. What could have bleached them? The riddle was solved by noticing that there were traces of a faggot-stack which had until the last few months covered the whole stole. Through this the shoots had pushed their way to the light, on reaching which their bark had assumed its natural green tint. With their greenness they had also gathered strength, whereas the bleached portions were so weak that they could not support the stems and could be bent in any direction. Some of the shoots instead of being light yellow-white were of a beautiful salmon-pink tint.

It will be of interest to note whether, now that they are exposed to light, the bleached tracts will form chlorophyle and become green; also whether they will be able to strengthen themselves. Not only were the bleached portions weaker than the rest, they were actually much smaller, thus indisputably proving the value of well-developed bark in the laying on of new wood. Microscopic sections of the bark from the different portions illustrated what might have been expected as regards the absence of chlorophyle in a most instructive manner.

The Gooseberry Mildew.

In the *Journal of the Board of Agriculture* last December, fruit-growers, nurserymen and gardeners are warned of the appearance in more than one place in this country of the dangerous American gooseberry mildew—*Sphærotheca mors-uvæ*. The Board urges the destruction of all affected plants and the spraying with Bordeaux mixture of all others suspected of being infested, and they advise growers to purchase only from dealers who can guarantee that the plants they are selling are of their own growing, and that no case of the disease has ever appeared in their district, and that the said plants have not been near any other gooseberry plants recently brought into the dealer's premises.

"The mildew generally becomes visible during the last half of May or the first half of June, when it appears in the form of 'glistening frost-like spots' on the fruit on the lower part of the bush, where there is usually dense shade. It then spreads to the leaves and tender shoots. In its earlier stages it has a cobwebby appearance, which soon becomes white or powdery from the development of the light conidial spores. Later in the season the leaves and other parts affected turn a rusty brown. The fungus prevents the berry from growing and the fruit becomes worthless. During the summer, therefore, the disease can easily be detected and the bushes can be dealt with according to the extent of the disease."

THE TARPON AND ITS SCALE

One of the largest edible fish is the Tarpon. A specimen may be seen in the Haslemere Museum. The tarpon is by relationship a herring and belongs to the family *Elopidæ* and subfamily *Megalopinæ*. The specific name is *Megalops atlanticus*. It is one of the big-eyed herrings and is sometimes called the Jew-fish. It is a near relative of the *Elops saurus*, but the pseudo-branchiæ are absent and the dorsal fin has a long filament. Its scales are very large and are often used in ornamental fancy work. It is of a brilliant silvery hue, darker on the back. It may attain a length of 6 feet. It is common in the subtropical regions of the Atlantic and gives good sport to the angler. In the southern part of the United States it is known as the "big-scale" (*grande-écaille*). A specimen weighing 180 lbs. has been recently presented to the Norwich Castle Museum by Mr. Hugh Gurney, who captured it in Florida. Our specimen measures 5 feet 8 inches. We possess scales from other specimens, measuring 3¼ inches across, and which might serve as small window-panes, being translucent.

SEASONAL NOTES.

Thoreau's suggestion, "You only need sit still long enough in some attractive spot in the woods, that all its inhabitants may exhibit themselves to you by turns," is not quite suitable for a damp January day. It is possible, however, if position favours, to see much of interest without waiting long or running risk. One afternoon late in December the writer entered a birch coppice armed with a pair of Zeiss binoculars, and took his stand in what seemed a suitable spot and waited. In a few minutes a flock of small birds very silently settled into the tops of the trees, and as silently commenced feeding. They were greenfinches, mostly females, and all were dining off birch seeds. Their methods were easily observed through the glass. The catkin was seized with one foot, usually low down, and by a quick movement bent towards the twig on which the bird was supporting itself with the other foot, then, by another quick movement, both twig and catkin were simultaneously clutched. The birds fed with great rapidity, carefully rejecting the scales and eating only of the seeds. The sodden brown leaves beneath the trees were covered with the little scales which had been thrown down. Several titmice arrived; these chiefly busied themselves with an investigation of some pollard oaks which grew amidst the slim and slender birches.

These birds were so restless that it was impossible to observe exactly what they were doing. Probably they were seeking a small fly with delicate blue wings, which was afterwards seen to be present in some numbers on the fungi which covered the cut surfaces of the pollards. At intervals some flew up to the tops of the birches, as if desirous to know what the other birds were feasting upon. But a vegetarian diet was not to their liking, and, with shrill cries, they quickly returned to the haunt of their natural food.

Some birch twigs with catkins upon them were gathered and taken home and examined. The pillar to which the seeds and scales are fastened varies from $\frac{7}{8}$ to $1\frac{1}{8}$ inches in length. It is yellow and about the thickness of thread. The stalk supporting the catkin is $\frac{1}{4}$ inch long, and twice as thick as the pillar. It is very firmly fixed to the twig, and in section is bright green. A careful counting of the seeds and scales in what appeared to be a perfect catkin showed that there were 75 scales and 150 ends. Thus it would appear that each scale encloses two seeds.

Very few of the oak leaves now thickly covering the ground retain any spangle galls. In those that are kept we shall probably fail to find a living occupant. It is not usual for these galls to be retained, they generally fall many days before the leaves. The large coloured cherry-like gall, on the contrary, often falls with the leaf. They are not common, but one may now and then be picked up.

The round grey patches so common on the underside of the brown oak leaves—sometimes two, three, or even four occur on one leaf—mark the mines of the larva of a species of *Lithocolletis*, a genus of minute moths. If the mine be carefully opened with a penknife and examined with a pocket lens, there will be seen in many of them the brown pupa snugly ensconced in a cocoon made of its rejectamenta ; the pellets being woven together with silky hairs.

Three very conspicuous fungi may be observed on dead stems of gorse and broom, especially the latter, throughout January and February. The first is the well-known Witch's Butter, or Yellow Jelly Sprout (*Tremella mesenterica*). It forms bright yellow tortuous masses about $1\frac{1}{2}$ inches across. The second, which forms a thin, paint-like reddish layer on the bark, is familiar to the mycologist under the name of *Peniophora incarnata*. The third is an agaric, one of the very few which bears a really distinctive English name.

It is known as the Velvet-stem. The pileus varies from 1 to 3 inches in diameter, and is usually yellow and somewhat sticky. The gills are pale opaque yellow, stem 2 to 3 inches long, always velvety dark brown or purple, paler above. This species usually grows in tufts.

Among the birds that sing in January, we may mention the Song Thrush, Missel Thrush, Redbreast, Great Titmouse, and Skylark.

The following wild flowers may be found in flower during the month: Shepherd's Purse, Groundsel, Gorse, Primrose (in sheltered spots and in very mild weather only), Common Chickweed, Daisy, Red Deadnettle and White Deadnettle, the Hellebores, and the male catkins of the hazel. Late in the month the following may perhaps be found: Buxbaum's Speedwell, Dog's Mercury, Coltsfoot, Annual Meadow Grass, Dandelion, and Lesser Celandine.

The retention of their dead leaves by certain trees is a phenomenon which may now be observed with much interest. Those who will turn back to our first number (May, 1906) will see depicted two oak trees, exactly alike in age and general conditions and standing close together, one of which is thickly covered with leaves and the other wholly bare. At the present date those two trees are again in precisely the same condition as they were when the photograph was taken. Thus it is shown that individual trees retain their peculiarities in this matter.

The Plane trees in our London squares, some of them, keep a few brown leaves at the present time. These leaves are invariably on the topmost twigs. In this feature they resemble our birch trees and differ from our beeches.

In one instance a single very large bough of a plane tree was observed to retain its leaves in much greater abundance than any other part of the tree.

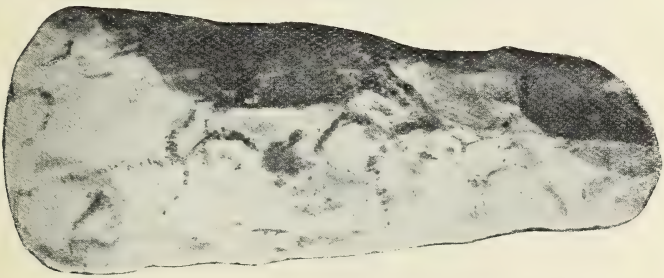
NOTICES OF BOOKS RECEIVED.

Neolithic Man in North-East Surrey.[1]—We have much pleasure in directing attention to the cheaper re-issue of this book. It is something more than a mere cut-and-dried account of explorations in a small area of a single county. In the opening chapters, the sequence of races in Britain and the Neolithic and bronze-using peoples are discussed. The following paragraph from the chapter on Neolithic England and Neolithic Surrey (p. 22) illustrates the authors' lucid and readable style: "The physical geography of Neolithic England was in sharp contrast with that of the Palæolithic period, but bore a very close resemblance to that of the country as we know it to-day. Britain was now sundered from the rest of Europe. The severities of the glacial epoch were gone, to return no more—that is, as we popularly reckon time. Yet there were considerable differences in the contour, climate, and occupants, which we proceed to indicate. If we would revert, in imagination, to Neolithic England, we must first extend the existing coast outwards to about the ten-fathom line, to undo the effect of the submergence which has since been going on. The Wash, part of the Thames estuary, and the Bristol Channel must become dry land. We must see thickets of scrubby oak, hazel, birch, and willow, thriving miles away from the modern coasts of Holderness, Lincoln, and Carmarthen; we must uplift the sunken peat-bed of Walton-on-the-Naze, and unite the Isles of Wight and Anglesey to the mainland. The miry swamps and glittering meres of Somerset are to reappear, the wide woodlands of Wye, Anderida, Arden, and Sherwood are to be real forests, untouched save for a casual clearing here and there on the fringes. The present artificial drainage system, whether of

[1] "Neolithic Man in North-East Surrey," by Walter Johnson and William Wright, with a chapter on Flint by B. C. Polkinghorne, B.Sc., F.C.S. With numerous illustrations and maps. Cheaper re-issue. Paper covers. 3s. 6d. net. London: Elliot Stock, 62, Paternoster Row, E.C., 1906.

the surface, as the result of scientific agriculture, or the deeper, vast network of dykes and canals, the product of growing commerce, must be thought away, so as to leave virgin forest and marsh flat, formidable business to the wayfarers."

This book, which has received high commendation from many authorities, should find a place on the bookshelves of all interested in the ancient stone weapons of this country. Through the courtesy of the publishers we are enabled to reproduce one of the numerous illustrations.



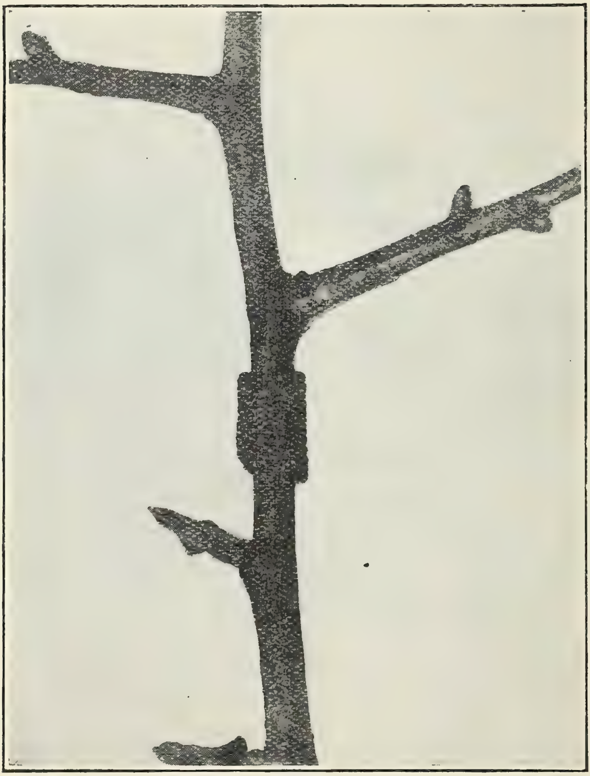
Description of the Figure.—Celt (Woodmansterne). From a photograph. "It is a fine specimen of the chipped and polished implement, in colour creamy white with a dark patch where the material is slightly different in character, and with a few iron streaks. The length is five inches, and the broad end is, of course, ground and polished, the cutting edge being still keen, while on one face, which is rather more convex than the other, the projections have been ground down." (From "Neolithic Man in North-East Surrey," by kind permission of Messrs. Elliot Stock.)

Insect Pests of the Farm and Garden.[1]—This little book is divided into two parts. The first treats of the structure and transformation of Insects, and Insecticides and

[1] "Insect Pests of the Farm and Garden," by F. Martin-Duncan. Illustrated with (44) original photographs and drawings. Crown 8vo, cloth, pp. 143. 2s. 6d. net. London: Swan Sonnenschein, 1906.

General Treatment; the second deals with some well-known pests considered under the three headings of Life-history, Mode of Attack, and Remedies.

The publishers have courteously allowed us to reproduce one of the illustrations. It depicts the eggs of the Lackey



Moth arranged in the characteristic ring-like band round a twig. Curiously enough, the author makes no reference to this moth in the text, though its larvæ are well-known pests in orchards, especially of apple, where they spin web nests.

Though in no sense a complete guide to the subject, Mr. Martin Duncan's book should be of service to gardeners and

others. We would point out that much might be done towards getting gardeners to take an intelligent interest in the life-histories of the insects frequenting their gardens (only too often to their detriment) by presenting them with a book such as the one under consideration.

Description of Figure.—Eggs (ova) of the Lackey Moth. Reproduced by permission of the publishers, from "Insect Pests of the Farm and Garden." "The eggs of insects are deposited during the spring, summer, and autumn, and in many cases the eggs deposited in the autumn remain unhatched until the following spring. Larvæ which emerge from the eggs in autumn may either feed rapidly and change quickly into pupæ, or remain as hibernating larvæ during the whole winter, becoming active with the return of spring and abundance of vegetable food. Many perfect insects survive the winter in a state of hibernation, and deposit their eggs in the following spring. The larval stage lasts over a very varying period in different species of insects—from a few weeks to three or four years, or longer" (p. 16).

Field and Forest Handy Book.—We have received from Messrs. George Newnes a copy of the "Field and Forest Handy Book," by D. C. Beard. It is stated in the preface that "it is essentially a book for the use of readers who are living, for the time being at any rate, close to Nature in field and forest, men as well as boys." It is divided into sections according to the seasons. From it one may learn how to build a cheap boat or a real log house; how to camp out in the backyard; how to make a herbarium; how to keep game and fish in camp; and many other things that a squatter or settler should know.

It consists of 422 pages of good clear type and 543 illustrations. We can recommend this practical book as an appropriate present to send as a gift to settler friends abroad. Crown 8vo, cloth, gilt. 6s.

Social Life in England.[1]—Much interest attaches to a well-written account of the social life of our forefathers, such as may be read in the volume now before us. Though this "account of the social changes that have taken place throughout the ages" must of necessity be a brief one, affording here and there only the veriest glimpses, yet considering that it is condensed into some 400 pages of clear type, the author has done his work well and presented us with a series of very pleasantly written chapters. Even trivial matters, as the author surmises in his introductory chapter, have their interest. We are reminded "that William the Conqueror ate with his fingers and never saw a coal fire; that the two thousand cooks of Richard II. could make neither a plum pudding nor mince pies; that Chaucer never saw a printed book; that Queen Elizabeth never heard of tea or saw a newspaper; that George I. had no umbrella, and that Queen Victoria was the first sovereign of our island home who had not to depend on wind and weather to leave her kingdom."

Beza's Icones: Contemporary Portraits of Reformers of Religion and Letters.—To all who feel that they have been in any degree forgetful in the way of Christmas gifts, we can cordially recommend this work. It will be acceptable at any season and to all who take interest either in portraiture or history. It contains forty-nine full-page portraits; thirty-eight of these are facsimile reproductions of Beza's Icones, the other eleven are from Lombard's translation of Beza. The Editor, Dr. C. G. M'Crie, has supplied to them all concise but very readable biographies. We are interested to observe that he acknowledges exceptional indebtedness in his work to a distinguished naturalist, Dr. Carruthers, late the Keeper of the Botanical Collection in the British Museum.

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[1] "A Short History of Social Life in England," by M. B. Synge, F.R.Hist.S. Crown 8vo, cloth, pp. xvi. and 407. 6s. Hodder and Stoughton, 1906.

Amongst those represented we have Wyclif, Jerome, Tyndale, Savanorola, Erasmus, L'Hopital, Francis I., and of course Luther and Calvin. The book is published by the Religious Tract Society, and costs but half-a-guinea. We give at p. 402 an example of the portraits, from a block kindly loaned to us for the purpose.

USES OF SHELLS (A MUSEUM LABEL).

Shells are used for many and extremely varied purposes by all nations. Amongst savage tribes their uses are chiefly for ornament, but also for performing every-day functions, knives, spears and fish-hooks being made of hard shell.

In this Case we have:—

A. Shell ornaments from prehistoric Peruvian burial grounds. These are chiefly bracelets of mother-of-pearl, and the ringed Cowry (*Cypræa annulus*).

B. Shell bracelet from the Hermit Islands. Made by the natives from the Chank Shell (*Turbinella pyrum*).

C. Shell spoon, probably cut from a species of *Pyrula*.

D. Mother-of-Pearl shell (*Meleagrina margitifera*). Chiefly used for making buttons, also for inlaying papier-mâché, knife handles and ornamental articles.

E. Stromb Shell (*Strombus gigas*). Imported in immense numbers every year to be ground into powder and used in the manufacture of the finer kinds of porcelain.

F. Shell chisel from the Barbadoes. Probably fashioned from a species of *Tridacna*. Used by the Caribs prior to the introduction of iron, there being no stones on the island suitable for making implements.

G. Nautilus Shell (*Nautilus pompilius*) from India. Used as a drinking cup.

H. Scallop Shells (*Pecten maximus*). The flat valves are used as plates, and the hollow ones for skimming milk, also as drinking vessels.

I. Whelk (*Fusus antiquus*). Used as a lamp in some parts of Northern Europe, being suspended horizontally with a wick along the siphon-channel.

J. The Money Cowry (*Cypræa moneta*). Still used in some districts on the West Coast of Africa as a trade currency. In 1840 they were imported into England in great numbers and sold to African traders, the price being £20 per ton.

K. Window-glass Shell (*Ostrea placenta*). Used in Japan and the southern parts of China as a substitute for glass.

L. A small valve of the Giant Clam (*Tridacna gigas*), the largest known bivalved mollusc. Large specimens are used as basins, &c.

CORRESPONDENCE.

GOETHE, speaking of the delights of youth, wrote: "Jugend ist Trunkenheit ohne Wein." The same idea is to be found in Aristotle: "They are sanguine in hope, for like persons who are drunk with wine they are inflamed by Nature" (Wright's "Life of Fitzgerald," vol. i., 158).

LOCAL MUSEUMS.—The late Mr. Toynbee published anonymously—or rather in the name of the Treasurer of the Wimbledon Museum Committee—a little book entitled "Hints on the Formation of Local Museums." Although his book contains, as a matter of necessity, much in commendation of educational arrangements in all museums, it still has as its essential idea the restriction of the work of collectors to local objects. One of the rules of the Club was, "No object to be received into the Museum unless found within a radius of five miles from the Parish Church." This little book is, we believe, now out of print. It was a very valuable pioneer effort in the direction of genuine Natural History work.

TO THE EDITOR OF THE "MUSEUM GAZETTE."

In reference to your suggestion as to the desirability of forming Museum Societies "in all towns and in many villages" (*supra*, p. 278), may I remind you that such an institution has existed in Hastings for upwards of sixteen years, under the name of the "Hastings and St. Leonards-on-Sea Museum Association." This Association was founded on May 11, 1890, with Lord Brassey as President, and Mr. William Vandeleur Crake as Hon. Secretary. In the same year a beginning was made to accumulate material, and later on a portion of the local geological collections formed by the late Mr. S. H. Beckles, F.R.S., was purchased, while the late Rev. J. W. Tottenham, of St. Leonards, gave the whole of his extensive and valuable private museum.

In August, 1892, the Hastings Museum was formally opened to the public. Practically, the whole of the funds for maintenance and development were provided by annual subscriptions and donations until April, 1905, when the Museum was transferred to the Corporation of the Borough.

Unfortunately, however, the sum appropriated to the needs of the Museum by the Corporation is at present inadequate, and the Association conceived the plan of supplementing the grant, and of maintaining the interest of its old supporters by continuing its existence. By the terms of the deed of transfer the Association further secured to itself the privilege of nominating six members for election to the Corporation Museum Committee.

I suppose Hastings is not alone in having a publicly owned Museum inadequately supported by public funds, and hence I cordially approve the suggestion contained in your note.

Corporation Museum, Hastings. W. RUSKIN BUTTERFIELD.

NOTE FOR MICROSCOPISTS AND ZOOLOGISTS.—Mr. Arthur Thomas (Boscombe) writes: "I do not think it is generally recognised what an excellent hunting ground is the *Fontinalis antipyretica* growing on lock gates, millstream walls, and other similar places. In one lot from the moat at Christchurch I found specimens of Mollusca (*Paludina*, *Bithynia*, and *Planorbis*); Crustacea; larvæ in great profusion, some of the caddis-worm type; three or four varieties of rotifers, a form of *Vorticella* new to me, and *Stentor* in great profusion."

A MANUSCRIPT OF JOHN FOSTER.—Some of our readers who may have been interested in what we have written respecting John Foster, may like to know of the following item which we extract from Tregaski's catalogue (232, High Holborn):—

170 FOSTER (John, the Essayist) Notes for a Sermon in his autograph, on 4 pp., 8vo, bound in a volume, with letter of authentication from his daughter, and a note by the late owner, half morocco, **8s 6d**

Grew, on Trunks.—The following, which, like the preceding, we take from Tregaski's catalogue, may be of service to some of our readers. Nehemiah Grew was a remarkable man. His descriptions, and the illustrations which accompany them, are very quaint, but they are truthful and valuable.

205 GREW (Nehemiah) The Comparative Anatomy of Trunks, together with an Account of their Vegetation grounded thereupon. Sm. 8vo, First Edition, 19 large folding copperplates of sections of branches, trunks, &c., as seen through a microscope, original sheep, **21s** 1675

*** Read before the Royal Society, February 25th, 1674-5, and June 17th, 1675, of which Society the author was a Fellow, and later the Secretary. He was one of the most eminent of vegetable physiologists, and is said to have been the first to observe sex in plants.

Smut of Corn.—According to Brefeld, the well-known German botanist, the spores of barley and wheat smut infect the plant only through the flower. In most instances the spores are dispersed by wind, occasionally they are carried along with pollen by butterflies. Upon alighting on the stigma the spores germinate and penetrate the ovule, where they remain until the following season. If seed infected in this manner is sown, the fungus grows up with the plant, and ultimately produces the characteristic black powdery mass in the ear instead of grain.

Absorptive Power of Mosses. —Csercy has recently demonstrated that many common mosses absorb about six times their own weight of water in less than one minute, but require a week to give it all up again.

Eggs.—It is asserted that we import per annum fifty-six eggs per head for the population of Great Britain, and that the cost of foreign eggs and poultry taken together reached in 1900 nearly six millions and a half sterling.

A German naturalist has recently discovered hairs of mammals in amber (fossil resin). Amber containing insects may be seen in most museums.

A species of frog from the Cameroons measures no less than 10 inches in length of head and body. It has been appropriately named "*Rana goliath.*"

The Zoological Department.

THE

MUSEUM GAZETTE.

No. 10. FEBRUARY, 1907. Vol. 1.

EDITORIAL NOTES.

To any subscriber to the Gazette who will name correctly twelve of the Natural History objects shown in our Frontispiece we offer a selection from our Catalogue of Books, &c. to the value of Five Shillings. Residents in the Haslemere district will be required to name twenty-four and will not be allowed to name any which cannot be identified from the plate alone.

A criticism on our remarks in last month's Gazette which has appeared in the *Naturalist* affords us an opportunity for further explanation, of which we gladly avail ourselves. Our critic appears to be under the misapprehension that we wish to disparage Local Museums. That is very far from being the case. At Haslemere we have developed a local section in an Educational Museum to the best of our ability, and have constantly a local vivarium in demonstration, and recurring special exhibitions of local objects. We have urged that every Educational Museum ought to have its local department. Our protest is against the unwisdom of making museums designed to be educational exclusively local. Local museums are exceedingly good, but Educational Museums with local departments are, we think, far better.

Perhaps after all there is a fundamental misunderstanding as to what is meant by a "Local Museum." We understand

it—as Mr. Toynbee, the pioneer of "local museums" understood it—as one which receives nothing but what has been collected within a radius of five miles from the Parish Church, or at any rate, within some definite area. Our critic writes of York and Chester that they have "*strictly local* museums of the greatest value and importance." We are familiar with the very excellent general museums of the cities named, but never heard that either place had also a "strictly local one." At Geneva there is a large and well-arranged local museum—local that is to Switzerland—but it is quite new and is additional to a splendid general one. No doubt some other large cities have strictly local collections, but we suspect that they are invariably supplementary to general ones. They certainly must be so in York and Chester, if they exist at all; we cannot help suspecting, however, that our critic either does not recognise any difference between local and general, or that he is drawing upon his imagination as regards these places.

Lord Thring has just died at the age of 88. He was the brother of the distinguished headmaster of Uppingham, and they were the sons of parents who attained respectively the ages of 90 and 101. Such facts suggest the question as to how far family longevity may be regarded as conducive to social progress. Lord Thring is estimated by the *Times* as "one of the greatest and most influential legislators of his time. . . . A public servant of rare capacity, indefatigable industry, and disinterested devotion to the public service." He was an intimate friend of Mr. Gladstone, another example of the conjunction of ability with longevity. We may also note that Lord Goschen, who has died at the age of 76, was the grandson of a distinguished man who lived in vigorous and active life to the same age.

The question suggested in the above paragraph must be dealt with broadly. It is not one which can be decided by the citation of individual facts. Are communities in which longevity prevails more distinguished by intellectual achieve-

ments than those in which the average of life is shorter? How about long-lived families? To live long implies the possibility of accumulating large stores of experience. It also implies in most cases a comparative freedom from the disturbing influence of ill-health in early and middle life. It frequently implies also self-control and moderation in all things.

WORDSWORTH wrote: "Ah me! the good die young, but they whose hearts are dry as summer's dust burn to the socket," and then went on himself to the age of 80, in confutation of his own dictum. Goethe lived to be 83. "Paradise Lost" was written by a man aged 57, and who subsequently lived to be 66. "Don Quixote" was the work of a man far past middle age, and could not conceivably have been written by a young one. It is true that Keats died young, but it was of consumption. Plenty of facts on both sides might be collected, but could the balance be fairly struck it would be largely on the side of good health and longevity. It must, we may repeat, take cognisance of the family and not solely of the individual.

COGNATE with the topic just referred to is the question whether the age of parents is a matter of indifference to offspring. Is it an advantage to be born of young parents or of those more advanced in life? In respect to one half of parentage Nature has placed limits, but they are not such as to preclude possibility of comparison. Many facts might be adduced in support of the proposition that children of very remarkable precocity are often the offspring of middle-aged mothers and almost aged fathers. But precocity does not always imply a progressive brain.

The Illustrated London News of January 19 contains a pathetic representation of the sale of their children by Russian parents during scarcity. Apparently a purchaser who is leading off a pretty little girl is a Jew. It may be

well to keep in mind in our ethnological investigations that in all ages the Jews have been slave-dealers. During the Saxon period of British History it was not uncommon for parents to sell their children and Jews were the traffickers. Eccleston writes, respecting British trade in these times: "Horses also are supposed to have been exported and more certainly *slaves*. Many of the slave traders were Jews who found a good market for their victims amongst the heathen Saracens in Spain and Africa. This gave rise to several canons of the church against selling Christian slaves to Jews or Pagans. Chester and Bristol were the great ports for this abominable trade so far at least as related to Ireland, where Saxon slaves were largely purchased, probably by the Danish settlers." These facts ought to open our eyes to possibilities as to admixture of blood in various directions. Even into Semitic families there may occasionally have been brought Teutonic or Celtic brides.

Can any of our readers direct our attention to instances of birds storing winter food? It is asserted that the nuthatch does so. Can the observation be authenticated and can details be given? It is a bird of developed instincts, and in its habit of fixing nuts in clefts of bark preparatory to opening them it comes near to the use of tools. The common shrike has its butcher's shop in which it hangs up its victims, but this appears to be merely a matter of temporary convenience and not an instance of provision against future want. The popular belief that the nuthatch sits upon nuts as if they were eggs may possibly have its origin in its habit of accumulating stores for winter use.

We are glad to see that a complete skeleton of the Okapi has, through the zeal of Major Morrell Cotton, reached the British Museum. A good skin of an adult and a perfect skin of a young animal have also been obtained, and will, doubtless, soon be exhibited in our national collection.

AN INTERVIEW WITH THE EDITOR.

Although, Mr. Editor, you have been obliging in answering our letters, we have ventured to seek an interview in the belief that by some *vivâ voce* explanations, we may perhaps both save you trouble and get more explicit information.

Well, I shall be happy to be cross questioned, and will reply as best I can. What is the first article of accusation?

We have no accusations to bring but wish merely to mention some points which to our minds you have left obscure. To begin with, in one of your first papers, you asserted that there was good reason for believing that men had lived on the land now called Britain for a quarter of a million years. We want to know what is the nature of the evidence which supports such a statement.

First let me suggest that there is nothing improbable in it. It is quite certain that the land which we now call Britain existed at even much more remote periods, and was the home of animals of comparatively modern species. In association with the bones of such animals there have been found the flint tools of human beings.

But why do you fix upon a quarter of a million?

It is the calculated date of the great ice age, but of course it is only approximate.

We have observed that in an extract which you have taken from Professor Ray Lankester, the period is given as only 150 thousand years.

Do you really feel that it matters very much whether you accept his estimate or mine? If you do, I most willingly give way to him, although I much suspect that the reality exceeded what we have either of us alleged. The great point is that we should recognise that the periods during which the earlier stages of human civilisation were enacted, were almost inconceivably long.

We have noted that you seem to wish us to attach much

importance to the shape and size of the skull, and to the features, as affording some clue to character.

Not perhaps quite so much as you have supposed. You may by a man's features diagnose his race, and when you have got at his race you may guess at his character.

You think that race proclivities are permanent?

They may be diluted but they are never wholly lost.

Did you seriously mean to trace for Goethe a Jewish pedigree?

Yes, but a diluted strain. It does not follow because a man is born in Frankfort that none of his ancestors were born in Palestine. I have no belief in the development of transcendent genius from a newly civilised people such as the German Teutons. You must remember Goethe's face: his arched nose, his black Italian eyes and the character of his life-work. He was no unmixed Teuton.

You seem to think lightly of the Teuton stock.

By no means—it is an excellent one. A noble minded race; but as to civilisation and developed intellect a quite modern one.

You think possibly that in other instances the genius which we credit to Germany is really in part of Hebrew origin?

Yes, certainly, and in many other places. The dispersal of the Jews was, as well as that of the Greeks, an event of the utmost importance for the advance of the mental culture of Europe. I would like, if you will allow me, to read to you half a page from an article in *Temple Bar* which interested me much after dinner yesterday. The paper was on Russian literature, and more especially on Korolenko, the novelist. It quoted from Dostoyevsky, who said of his countrymen:—

"We have one trait widely different from anything in the European—a high capacity for synthesis, a talent for a universal reconciliation, an all-humanness. There is nothing in us like the European angularity—no impermeability, no stiffness. Our character easily accommodates itself to everybody, adapts itself to every kind of life. It

sympathises with everything that is human, without any distinction of nationality, blood, or soil. It finds out and immediately admits to be reasonable whatever may contain but a grain of all-human interest. It is possessed by a sort of instinct of all-humanness. At the same time you may observe in a Russian an unlimited capacity for the soundest self-criticism, the soberest judgment of himself, and a complete absence of self-assertion which is sometimes prejudicial to freedom of action."

When I read this, I said to myself, He is describing the best class of Jewish characteristics rather than Russian, and you may judge of the pleasure with which I followed the text—

"Korolenko's life and work are an excellent illustration of this thesis. He was born in 1853, in Jitomir, a largely Jewish town in the province of Volynia."

You think, then, that Korolenko was probably of Jewish descent?

Yes, and Dostoyevsky also.

But they both of them have Russian names, and the Jews in Russia do not intermarry with natives.

That is true, but this is how it comes about. Not infrequently a benevolent and enthusiastic Christian has an opportunity—after a massacre, perhaps,—of getting possession of a beautiful Jewish child. The child is adopted, christened and renamed, and in the course of a few generations its lineage is lost, but not its blood. I have no more belief in high literary genius springing up native amongst the Slavs than amongst the Teutons. It is produced only when an old race is engrafted on a young one, receiving from it its vigour and at the same time conferring its own deeper insight.

SOME OF THE PHENOMENA OF FROST.

Cat-ice is ice which has air under it, and which is so thin as to be hardly strong enough to support a cat. It is formed when a night-frost follows soon after rain. The puddles, cart-ruts, &c., are then full of water. The surface under the influence of a cold wind suddenly freezes. Meanwhile the water has been soaking into the ground and leaves a layer of ice no longer supported below. The ice now protects from the wind the water remaining under it and prevents further freezing. Cat-ice is rarely translucent, but looks more or less opaque and white. This appearance is in part illusory and caused by what is seen beneath the ice, but in part it is real, and caused by the formation of white crystalline particles of hoar frost on the under surface of the ice.

Hoar Frost, or white frost, is produced under two somewhat differing conditions. Its most common state, that in which the fields and ground become white, is caused by the freezing of dew which has settled upon the points of the herbage, leaves of trees, or fragments of stone. It occurs when the nights are clear, still, and cold. As soon as the temperature sinks below dew point, moisture is deposited, and at once congeals in a crystalline condition which looks white. A liberal white frost always implies a preceding clear night during which radiation has been free. The hedges, bushes, &c., are always more or less implicated when hoar frost forms on the ground. There is, however, another form of white frost of much higher glory which results from the sudden freezing of a wet mist. For this to occur the air must be heavily laden with moisture, the sky hidden by fog, and the onset of cold, sudden and without wind. Every tree is dripping with water, and all the water becomes white ice. The process may go on for hours, and festoons of glittering white with fragile icicles in them result. If, after such a night, the

atmosphere should clear, a scene of wonderful beauty is revealed by the morning's sun. Every object stands "clothed in white samite, mystic, wonderful." The apparition will last but an hour or two. It is one which in its highest perfection is seldom seen, not more perhaps, than once or twice in a lifetime, but on a smaller scale it is not uncommon.

Frost Fern Patterns on the Window Pane.—From the earliest childhood we have all gazed with delight at the beautiful patterns produced by ice on the window-glass. Palm-leaves, fern-fronds of wonderful delicacy and finish, all most gracefully curved, end in points. Their explanation is not very difficult, and however inexplicable, at first sight, the arrangement may appear, a little close attention will clear away the obscurity.

The presence of moisture on a window pane always proves that the air is colder on the side that is dry than on that which is wet. Almost always it is the inner side that is wet and the outer side that is dry. The frost-patterns which we refer to are always on the inside and they result from the freezing of the moisture which has been condensed. The thicker parts of these ice encrustations are always on the lowest part of the pane. The fine leaf-like patterns always branch upwards. Their points, which are the thinnest parts, are always at the very top and very usually the uppermost part of the pane is altogether free. Not infrequently there may be seen large well-margined spaces on the frozen part, which are quite free from ice, and dry.

To understand these conditions it is well to inspect the pane over night. The distribution of the moisture may then be seen to be in its main features exactly what the ice will show in the morning, but of course without its beauty of arrangement. Over-night the moisture will be seen to be draining downwards and to be most in quantity on the lowest part. The same rounded spaces, shaped like bays or inland seas, will be noticed. The explanation of these, as of the whole pattern assumed by the ice, is to be found in the

action of air-currents aided, of course, by the tendency of the moisture to gravitate downwards. If there be a crack in the pane, or a chink in the framework-fitting, there will occur a quiet air-current which may dry up the moisture at any part and which will distribute the moisture-charged air over other parts. The projecting bars of the window frame, the window curtains, and any objects in any degree shading the window will have their influence, and it must be remembered that in all rooms there is a flow of the warmer air upwards. To the combined influence of all these, the coruscations of ice films which so delight us on drawing the blinds in the morning are to be attributed. It may in any particular case need some perseverance and ingenuity to trace out in detail the explanation of all that is there, but this is to be done on the lines which we have pointed out.

In neglected rooms in town houses somewhat similar feats of arrangement are occasionally accomplished by dust, but the conditions are not precisely parallel. The dust is usually blown upwards from below, and under the influence of currents it forms columns which have their apices pointing upwards, but it never, of course, in the least rivals the crystalline figures due to frost.

"Jet Black Ice."

Canon Rawnsley, in the *Times* of February 5, wrote from Keswick: "Three nights of frost varying from 14 to 22 degrees, have given us *jet black ice* from one end of Derwentwater to the other." The appearance of blackness in ice is of course, an illusion, as the Canon doubtless knew well. It is produced when the ice is perfectly smooth and the water of great depth. Under such conditions the ice is beautifully transparent both on its surface and in its structure, and permits of vision into the black depths below. We have had a remarkable succession of what are known as "black frosts" this winter.

THE WOODS IN WINTER.

Of those of our hedgerow and woodland trees which shed their leaves, the great majority now stand naked, and many things are revealed which were not noticeable whilst they were clothed. Amongst these we have the fact that almost all oak trees have many dead branches. We have claimed this circumstance as explaining the undue frequency with which oaks are struck by lightning. The dead branches soaked with water constitute good storage for the electric fluid, and become thus attractive to the opposite current in the atmosphere. They are natural lightning conductors. Now is the time to satisfy ourselves as to the abundance of such on the oaks. On the contrary, we may look long into the heads of beech trees without finding a single dead bough, and beech trees are known to be almost immune from lightning. The expression "stagheaded" is not applicable to the ordinary state of oaks which show dead branches. The latter are not specially grouped in the head of the tree, indeed, they are but rarely placed there, but occur scattered irregularly, and some of them quite low down.

It is a little difficult to explain why the oak should be so prone to let its branches die. It may, however, be noted with interest that oaks seem to be much more careless of their side boughs than beeches, and to aim more at central strength and height. Beeches spread very widely and their lowest branches are always their longest, and thus these escape the overshadowing of those above them. The oak has branches far less flexible than those of the beech, and dares not trust them so far afield; thus they become crowded together, and some are shut out from the light and are suffocated. The oak is, in its government, centralised and autocratic, the spreading beech inclining more to democratic imperialism.

In connection with what has been said above it is of in-

terest to note certain differences in the bole of the beech and the oak. The latter is usually rounded and even from the ground to a very considerable height; its branches have in the past contributed to its growth, but they have not preserved for themselves any permanent representation. The beech, on the contrary, often presents on all its sides, and quite down to the ground, ridges which are separated by deep furrows. If the latter are traced they will be found to depend upon the development of the branches to the downward prolongation to which the ridges are due.

The recognition of different trees when quite leafless may afford some interest. In the woods of the South of England we have commonly the following deciduous trees: the oak, the ash, the sweet chestnut, the birch, the beech, the mountain ash, the elm and the hazel.

The *Birch* is usually easily known by its white silvery outer bark and by the ease with which this peels and exposes underneath, beautiful tints of pink or salmon colours. But now and then a birch occurs which does not peel and is not white. When that is the case the smoothness of the surface and the abundant presence of narrow horizontal markings and scars will help in identification. In old birches the bark may become very rugged by cracking, and this is always most marked low down. Higher up a very characteristic feature is presented in the presence of long and deep troughs under the larger boughs. These become bigger and deeper as the tree ages and cause a fluted condition. A bough has always formerly stood on the top of a long trough.

In chestnuts there is no fluting under the branches, but very often large flat scars are seen which are bounded on their sides by curved slightly raised lines. These lines are absolutely symmetrical and meet at an apex just above the branch which has caused them. These elegantly margined scars become more marked with age. They must be seen to be appreciated. When very pronounced they denote a chest-

nut, but in oaks and some other trees there are occasionally not very dissimilar conditions produced. The smoothness of the bark in most chestnuts, and the presence of faintly marked lines or bands running vertically on the bole, may also help.

The *Beech* may be known by its comparatively smooth bark, often delicately marked by circular and horizontal ridges, by the horizontal outgrowth of its branches and the absence of cracks in the bark, and of dead twigs. It forms ridges under its branches, but they run straight downwards and are never in the curves which the chestnut shows. A dead branch may be surrounded by a collar and after a few years is embedded in a navel.

An *Oak*, whether young or old, is almost certain to show dead twigs or branches. Beneath them there is no furrow as a rule, and only occasionally any ridges. A circular bossy collar around the base of the bough is a common condition whether the bough be living or dead, and if the stump of a dead bough remains, this collar may become very marked and its enclosed umbilicus deep.

In addition to the above we may note another condition by which oak trees may usually be easily recognised. It is the abundance of lichens and moss which grow upon them. On chestnut there is little or no moss; on ash, birch and beech the moss rarely extends its patches higher up than a foot or two from the base, and lichens are scarce and have to be looked for. The reason that oaks are so rich in these epiphytes is that they grow slowly and allow their outer layers of bark to become old and dead. Now and then an ash bole shows lichens in abundance, but very seldom any moss. There are cases, it must be admitted, in which it is almost impossible to tell an ash from an oak by its trunk alone. The difference in growth of branches and twigs is usually definite, and in many cases the ashes at this season still bear tell-tales in the tufted foot-stalks of last year's keys.

The observer is precluded from looking upwards and is allowed to avail himself only of such data as the trunks of

the trees afford. If the upper part of the tree be brought into evidence it will in the case of the beech afford conclusive proof, the delicate tracery of the curving twigs being unapproached by any other tree. Between the oak and the chestnut there may be some difficulty. The absolute leaflessness of the chestnut, whilst the oak on the contrary almost always has a few scattered dead leaves remaining, the straightness of the twigs of the chestnut as compared with the short irregular ones of the oak, and the presence of dead wood in the latter, may all give help. A very common condition on the boles of oaks is the presence of tufts of little twigs, with now and then a small branch. When there are branches at this time of year they almost always carry dead leaves. Many of the tufts or patches to which we refer bear no twigs more than half an inch high, and others are merely covered with an immense number of buds. If there is one on a tree there are sure to be many. There is no doubt that they are initiated by the attacks of some gall-fly, and certain observations which have been made at Haslemere would seem to connect them with the *Trigonaspis crustalis.* These growths are seldom seen on any other tree than the oak, but now and then they are produced on the birch near to the ground. On the oak they may be seen high up as well as low down. The beech has a different mode of growth from any other tree, its branches having a tendency to become horizontal. It also very usually retains some dead leaves, and these are always more abundant on the lowest parts of the tree.

Of the coniferous trees there is only one, the larch, which sheds its leaves, and its mode of growth is so peculiar and so well known that nothing need be said as to its identification. To any one who inclines to attempt the task by the aid of the bole alone, it may be of interest to note that the bark of the Scots pine is deeply fissured and the cracks take the form of long vertical lines. The bark of the spruce is thinner and is at once recognised by the polygonal or circular

arrangement of the cracks, which in many cases have uplifted edges, and are therefore somewhat saucer-shaped. In adult trees the bark of a larch much resembles that of a Scots pine, but it is perhaps of a lighter shade of colour and not quite so rugged. Any doubts may be at once set at rest by peeling off a scale with a pocket knife. The under surface of larch bark is always a beautiful reddish-pink; that of the Scots pine fawn-brown and reddish-cinnamon, the two colours being sharply defined owing to the very definite lamination, the interior of each plate being reddish-cinnamon. The under surface of the bark of a spruce fir may be termed a biscuit colour.

Observation of the habits of the *Spiral Climbers*, more especially of the honeysuckle, is much assisted by the bare condition of the winter woods. Many fine illustrations may now be seen with but little trouble. In Pratt's "Flowering Plants," we read the statement that "the honeysuckle in its windings follows the sun from east to west." We are obliged to doubt whether this expression conveys appropriately what is intended. A curious modification of climbing may easily be found in copses where woodbines are plentiful. The stems often climb on themselves and form ropes for mutual support. As many as six strands may be counted in a rope. Such ropes rarely ascend much, but they move across horizontal distances of several feet. Woodbines certainly climb from right to left, apparently in the opposite direction to that of the sun in the heavens. Here and there a plant of Bryony may have escaped destruction by weather, and may reveal the windings of its course up some hazel stem. Of other spiral climbers we have nothing to note in winter. It is needless to say that the ivy does not climb in this fashion but goes straight up the selected tree, fixing itself by its aërial roots or suckers.

At this time of year it is not difficult for the observer, quite independently of information, to tell whether or not there has been any heavy fall of snow. The breaking down of the dead bracken (*Pteris aquilina*) is the most conspicuous sign, but in

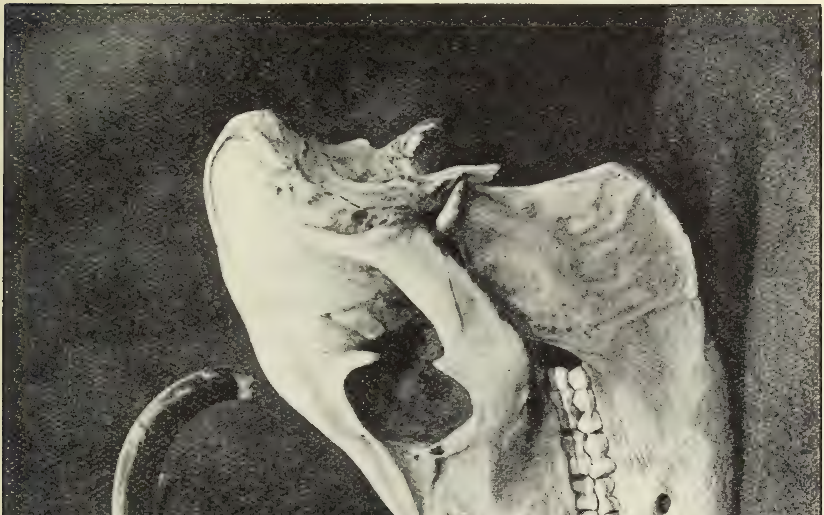
support of it the depredations of rabbits on the bark of trees will be noted. Holly and ivy are the trees attacked by preference, and of the latter the white gnawed stems are now very conspicuous in our Haslemere hedges and copses. So long as there is no snow the rabbits prefer grass and let the ivy alone, or it may be they have in previous winters eaten the bark as high up as they could reach. A thick fall of snow not only drives them to this resource, but enables them to mount higher up to get at it.

HOW THE STOAT BECOMES AN ERMINE.

The manner in which the brown Stoat of summer changes into the white Ermine of winter, is a matter deserving of careful observation. It may possibly not be uniform but as far as our observation has gone it is not through any stage of general greyness, but by the formation of white patches on the sides of the body which gradually extend and coalesce until only a band down the middle of the back and the whole of the upper part of the head remain brown. The whole of the tail loses its colour before the parts named, excepting of course the tip, which remains jet black. There is a splendid collection of well-stuffed animals showing various stages of change from brown through piebald to white, in the local museum at Geneva. Most museums have a few specimens, but unfortunately, it is but rarely chronicled in what month the animal was killed. It may be of interest to some of our readers to know that Mr. Gardner, the naturalist salesman in Oxford Street, displays at present in his window two excellent specimens of what we have described above. They are almost equally good as museum specimens, but the mounting is supposed to be better in the one than the other. He asks three guineas for one, and thirty shillings for the other, and they are well worth the money.

Have any of our readers in the South of England seen Ermines this winter? We cannot hear that any have been killed at Haslemere. It is an open question whether the severity of the winter has any influence on the change.

NOTES FOR A LECTURE ON SWINE.



SKULL OF BABIROUSSA (Incisor teeth wanting).

THE Lecturer should have on his table the skull of a pig, a full set of pig's teeth, the articulated bones of a pig's foot and a fresh foot in the skin. If obtainable he should also have skulls of the Hippopotamus, the Babiroussa and the Peccary.

With the hippopotamus, swine belong to a sub-order known as even-toed (artiodactyla), having four toes, the two middle long and the two others, *i.e.*, index and little, small. As in all four-toed mammals the thumb is wanting. All their digits have three phalanges and a metacarpal or metatarsal bone. Although four-toed they are only two-hoofed.

The snout is a proboscis cut short. Root-grubbers.

A special bone is developed in the snout.

Suppression more or less complete of hair. Bristles. Prolongation of the nasal bones.

Large development of dog-teeth (canines), which are, as tusks, chiefly used for defence, but sometimes for digging.

Remarkable direction of the tooth socket upwards in the Babiroussa, and perforation of the lip by the upper tusk.

Incisor teeth much less used than in grass-eating animals, and often small or deficient (see wart-hog). The lower incisors are directed forwards; compare with hippopotamus.

The Peccaries are the American representatives of swine. They have only thirty-eight teeth. The middle metacarpal bones unite to form a cannon bone, so also the metatarsals.

There are two kinds of peccary, one in North and one in South America. The peccary has a gland opening in the loin, which secretes an offensive fluid. Of what is this gland the homologue?

Thus, swine show relationship to cattle, horses and elephants, and are still nearer to the hippopotamus, which ought to be "the river pig." Their stomachs are only partially divided.

The oldest fossil remains of swine (Miocene) do not show such tusks as the present race, but in Pliocene and Pleistocene times the tusks had become well developed.

Pigs bear large families and are good mothers. They are courageous and intelligent. Capable of education. Keen scent. Truffle-hunters. Long face and short neck.

Lower incisors stand forwards for digging.

Of the Artio-dactyla, swine, peccaries and hippopotami do not ruminate whilst camels, llamas, chevrotain, sheep, oxen and deer do so.

The rim of the orbit in the pigs skull is never complete.

The swine, pig or hog family has several species.

The hog proper (*Sus scrofa*), common in Europe, Asia, North Africa, but not in northern latitudes. Unknown in Australia and on the American Continent. The Wild boar, Irish grey-hound pig (with dewlaps) and Indian hog, are only varieties.

The Babiroussa, or pig-deer, occurs in Borneo and Celebes; long and very peculiar tusks.

The Bush-hog of North Africa and Madagascar (*Potamochœrus pencillatus*) has very peculiar ears, looking as if they had been pared. It has warts and curved lines of white bristles on its face. The Wart-hog has large skin growths or warts under its eyes. Is very apt to lose its incisor teeth. (Ethiopia.)

Forty-four teeth are found in the true hogs.

Boars are not dangerous if unmolested, but are courageous and fierce when attacked. Fond of water and wet situations since their skins are not protected.

It is a curious fact that domestic swine have some tendency to become one-hoofed. This tendency is heritable, and in Texas there is a breed of one-hoofed pigs. The last joints of the middle toes are consolidated into one bone.

Specimens of the single-hoofed or Texas pig are not as yet easily obtained in England. They would be very instructive.

THE BEE ORCHIS.

The poet Langhorne noted the marvellous resemblance of the flower of the Bee Orchis to a bee in the following lines:—

See on that flow'ret's velvet breast,
  How close the busy vagrant lies!
His thin-wrought plume, his downy breast,
  The ambrosial gold that swells his thighs.

Perhaps his fragrant load may bind
  His limbs—we'll set the captive free—
I sought the Living Bee to find,
  And found the Picture of a Bee.

HOW TO MAKE A THORN-HOUSE.

You do not know what "a thorn-house" is? No. Nor perhaps have you any definite idea as to what is meant by "the preservation of twigs." No. Well, attend and we will try to make them clear. There are such things as salt springs. The water with salt in solution comes bubbling up though a rift in a limestone rock. It is, however, only a weak brine and how to get the salt out is the problem. Boil it down you will say. Right; but cauldrons and coal are expensive, wood is scarce, whilst there are thorn-bushes in plenty on the hill-side. Make a thorn-house. This is to be done by building a large gabled shed near the spring but on a lower level. This shed is fitted with a framework upon which bundles of small branches are laid in a slanting position. The water, conducted in pipes or gutters to the highest frame, is liberated by perforations and is allowed to trickle through the bundles, to be caught again in a gutter below. Owing to free evaporation only about half of what was put on at the top flows out below, but it is much stronger in salt. The process is repeated through another thorn-house at a yet lower level, and finally through a third. The brine is now strong, almost at saturation point with its salt, and a very slight employment of artificial heat will be sufficient to make it crystallise.

If the bundles of twigs thus employed were rapidly destroyed the process might still be troublesome and expensive. The twigs, however, do not decay rapidly, nor do they become encrusted with salt. The bundles in the first two houses require to be changed only every four or five years, but those in the lowest will last seven. They are, so to speak, pickled, and do not decay. Those in the first house take out certain salts of lime which the water contained and become crusted over until they resemble branching coral, or specimens from the Knaresbrough dripping wells. They fortunately take it all and send to the lower houses a purified brine, and one

nowise impoverished as regards its desired ingredient. The twigs are encrusted only, not really fossilised, the difference being that the lime is not taken into the substance of the wood. It is the same at Knaresbrough.

The above description of a simple but ingenious expedient for obtaining salt cheaply may serve to impress important facts in natural science. The chief of these is that salt water when evaporated leaves behind its salt. This is the clue to formation of salt marshes, salt inland seas, and if we go back to geological times, to the deposit of beds of rock salt. The great American salt lakes have been formed in this way, and the Dead Sea, whilst it is probably supplied chiefly by the solution of adjoining rocks, also owes much to evaporation of the waters brought down by the Jordan. The water resulting from such evaporation is pure if the process occur in still air, but may easily contain salt if there is wind. To the owners of a thorn-house a current of air is essential, but a high wind robs them of their salt. Many other ingenious (more or less) methods are in use for obtaining from sea water and other sources this great necessary of life. The principle in all is the encouragement of evaporation. In some instances the object is to change salt or brackish water into fresh. It is scarcely needful to remind even our youngest readers of the facts that the salt in water is in solution only, not chemical combination, and that all surface waters, even rain water itself, contains minute quantities of salt. It is from this source that many inland salt lakes obtain their supply.

An account of the various methods by which in the past salt has been obtained for domestic use, might constitute a very important chapter in the history of social progress. Although, in minute quantities, present almost everywhere, the problem of how to procure it has taxed the ingenuity of many a primitive race. It was one of the chief articles of early international traffic, and some of the first trade routes of which we have any knowledge were established for the conveyance of salt.

INSECT HIBERNATION.

In our notes on "Anticipation of Winter" last month we were obliged by necessity of brevity to almost omit from notice the habits of insects. The following notes are intended to supply in some degree the omission.

The eggs of many insects are subjected throughout the winter to extreme cold, which apparently does not impair their vitality.

Pupæ are more abundant than eggs in winter They are, for the most part, better protected against cold. Larvæ occur less frequently in a state of hibernation than pupæ. The majority are concealed in a simple hole or cranny. A few prepare winter retreats.

Many perfect insects hibernate, chiefly beetles, bugs, bees, and flies, and a few lepidoptera.

The winter sleep is usually spent in solitude. A few larvæ are gregarious, and some ants.

Usually, in a species, one stage only of the four stages of the life-history (egg, larva, pupa, and imago) is spent in hibernation. A few species, chiefly butterflies, hibernate in two, or even three stages. For example, the common Brimstone Butterfly passes the winter usually in the pupal state, but the perfect insect hibernates in houses, outbuildings, &c.

There are a few species which, strictly speaking, do not hibernate.

With a temperature below 45° F. the larvæ and pupæ of many insects pass into a torpid state, the vital functions are reduced to the lowest possible state, and so remain until the advent of spring. We may instance the larvæ and pupæ of flies. The angler, aware of this, buries the "gentles," as he terms the larvæ, in a cold place during winter, and thus ensures a supply of bait for the spring.

There are several instances on record of larvæ and pupæ reviving after being frozen so hard that they "chinked like stones" when dropped into a glass. Some larvæ, those of the

Brown-tail Moth, for example, prepare special winter retreats, in the shape of silken tents, but such instances are not common. As a rule terrestrial larvæ hibernate in holes in the wood or in wood, and aquatic ones hide themselves in the mud of streams and pools.

"The first cold weather, after insects have entered into their winter quarters, produces effects upon them similar to those which occur in the dormouse, hedgehog, and others of the larger animals subject to torpor. At first a partial benumbment takes place, but the insect, if touched, is still capable of moving its organs. But as the cold increases all the animal functions cease. The insect breathes no longer, and has no need of a supply of air; its nutritive secretions cease, no more food is required, and it has all the external symptoms of death. In this state it continues during the existence of great cold, but the degree of its torpidity varies with the temperature of the atmosphere. The recurrence of a mild day, such as we sometimes have in winter, infuses a partial animation into the stiffened animal; if disturbed, its limbs and antennæ resume their powers of extension, and even the faculty of spirting out their defensive fluid is reacquired by many beetles. But however mild the atmosphere in winter, the great bulk of hibernating insects, as if conscious of the deceptive nature of their pleasurable feelings, and that no food could then be procured, never quit their quarters, but quietly wait for a renewal of their insensibility by a fresh accession of cold" (Kirby and Spence).

"It is probable that some insects of almost every order hibernate in the egg state, though that these must be comparatively few in number seems proved from two considerations: first, that the majority of insects assume the imago, and deposit their eggs in the summer and early part of autumn, when the heat suffices to hatch them in a short period; and secondly, that the eggs of a very large proportion of insects require, for their due exclusion and the nutriment of the larvæ springing from them, conditions only to be fulfilled in summer, as all those which are laid in young fruits and seeds, in the interior and galls of leaves, in insects that exist only in summer, &c. The insects which pass the winter in the egg state are chiefly such as have several broods in the course of the year, the females of the last of which lay eggs, that, requiring more heat for their development than then exists, necessarily remain dormant until the return of spring" (Kirby and Spence).

The eggs are often attached to the bark of trees, where they may be found arranged like a bracelet round a branch or in compact masses, which vary according to the species. They are often protected with a hard shell, or surrounded with a warm coat of hairs.

PRESERVATION OF FUNGI.

The large woody Fomes and the smaller leathery Polystictus, with the resupinate Poriæ and nearly all the Thelephorei, require only to be dried in the air (in some cases under pressure to keep them flat) and in this condition they do not lose much either in colour or form. These are, consequently, the most commonly selected species which are collected by travellers in foreign countries, whilst the smaller or more fragile are neglected.

The whole of the Gastromycetes, excepting the Phalloidei, require little or no preparation. They only need to be collected when mature, and dried in the air. The same may be said of the Myxomycetes, which only require to be placed in small pill-boxes and secured by pins or otherwise, as insects are secured, so as to prevent injury in transit. In no case should more than one species be placed in a single box, or the spores will be transferred and confusion result.

With the soft and fleshy Agarics, the only method which we are prepared to recommend is to make a sketch or drawing with the form, size and colour as in life. It is not absolutely essential that they should be coloured, although that is best, but the colours should always be stated explicitly upon the drawings. To assist those who are not facile with the pencil, it is recommended that the specimen collected should be divided longitudinally through the cap, and down the centre of the stem. When this is done, one half should be laid on a sheet of white paper, with the cut surface downwards and the outline traced carefully upon the paper with a sharp pointed pencil. On removing the specimen there will be left upon the paper an outline of the form of the Agaric, natural size. This may be completed by hand, drawing in the line marking the margin of the pileus, indications of scales (if any exist), the character of the ring (if present), and the scales, lines, or markings of the stem. Another copy of the section

made side by side on the same paper would give the outline of the gills, and by a little care and practice it would be found easy to draw the line from the stem to the edge of the cap, indicating the point of junction of the gills with the flesh of the cap. This should be done very carefully and accurately, as it must be depended upon to show whether the gills are quite free from the stem at their inner extremity, or whether they are adnexed, or whether they are decurrent, and to what extent they run down the stem. Then, also, it should be shown whether the stem is solid or hollow. A little colouring, even if not artistic, would be more useful than mere description of general appearance. Of no less importance is the addition of notes, giving such particulars as cannot be conveyed by the sketch, and these would embrace a statement of *habitat*, whether growing on the ground or on wood. Amongst other details it should be stated whether the pileus was dry or moist, or glutinous, whether the odour was agreeable, or fœtid, or indistinct, whether the taste was mild, or acrid, or pungent, and whether the gills exhibited any tendency to deliquesce. Finally, if the drawing was not coloured, then the colour or the pileus and stem must be indicated as explicitly as possible, and not vaguely as red, brown, or grey, but what particular tone of each colour, whether bright red, or dull red, dark red or light red, vermilion or crimson, and so on, with any other colour, so that at any time the sketch might be completed in colour and made to represent the species.—From Dr. M. C. Cooke's "Introduction to the Study of Fungi."

One of Goethe's axioms, so pregnant in meaning and so valuable as affording a clue to discovery, was that there is "a law of unity which presides in the structure of all living bodies."

MALFORMATIONS OF THE BILL OF BIRDS.

Mr. John Blackwall, F.L.S., in his "Researches in Zoology," 1873) describes four instances of malformed bills, in which the mandibles crossed each other in the manner characteristic of the cross-bill. The first was a Jackdaw killed at Bowers in the parish of Standon, Staffordshire, and deposited in the Manchester Natural History Society's Museum in 1830. The mandibles crossed each other "at some distance from their points, the upper one curving downwards on the right side of the lower one, which takes an upward direction to the left." Though killed in severe weather this bird was in excellent condition.

The second was a Rook, also preserved in the Museum at Manchester. The mandibles crossed but slightly near their extremities.

The third specimen was in the possession of Mr. R. Wood, of Manchester, a well-known collector of natural history specimens. In it the mandibles were greatly elongated and much curved, as in the case of the Jackdaw. The upper mandible crosses the lower one on the left side. In the following case and the two preceding ones the upper crosses the lower one on the right side.

The fourth instance was a specimen of the Red-headed Woodpecker of the United States. In this case the mandibles "though pretty much elongated are but slightly curved."

No special examination would appear to have been made to determine the cause of the malposition in these cases. We may conjecture with great confidence that they were all consequent on injury to one of the mandibles. The injury—probably from shot—was most likely inflicted near to the base of the mandible and had the effect of preventing growth at the part involved; under such conditions the uninjured side would by its continued growth push the mandible over to

the opposite side. The remarks which we have made in connection with the curved Ibex horn are applicable here, as were also those which were appended to the head of a rook given at p. 237. In the latter, however, it was simply overgrowth in a straight line, for the extremity of one mandible had been shot away. In vegetable life the results of local injury in producing distortions are very abundantly seen. Whenever a twig is bent awry local injury somewhere between the bend and the trunk or bough is to be suspected. So in animal life, if the deformity be not a congenital one search must be made for evidence of proximal damage.

AGE OF THE BIG TREES OF CALIFORNIA.

"UNDER the most favourable conditions these giants probably live 5,000 years or more, though few of even the larger trees are more than half as old. I never saw a big tree that had died a natural death, barring accidents they seem to be immortal, being exempt from all the diseases that afflict and kill other trees. Unless destroyed by man they live on indefinitely until burned, smashed by lightning, or cast down by storms, or by the giving way of the ground on which they stand. The age of one that was felled in the Calaveras Grove, for the sake of having its stump for a dancing floor, was about 1,300 years, and its diameter, measured across the stump, 24 feet inside the bark. Another that was cut down in the King's River Forest was about the same size, but nearly a thousand years older (2,200 years), though not a very old-looking tree. It was felled to procure a section for exhibition, and thus an opportunity was given to count its annual rings of growth. The colossal scarred monument in the King's River Forest is burned half through, and I spent a day in making an estimate of its age, clearing

away the charred surface with an axe, and carefully counting the annual rings with the aid of a pocket lens. The wood rings in the section I laid bare were so involved and contorted in some places, that I was not able to determine its age exactly, but I counted over 4,000 rings, which showed that this tree was in its prime, swaying in the Sierra winds, when Christ walked the earth. No other tree in the world, as far as I know, has looked down on so many centuries as the Sequoia, or opens such impressive and suggestive views into history" (Mr. Muir).

On a Slab of Sandstone containing Crinoids.

(*Extract from a Museum Lecture at Haslemere.*)

The little slab which is now before us is amongst the more treasured contents of our Museum. I have never seen in any collection a better specimen of what used to be known as the Sea-lily or the Stone-lily. The thing shown, however, is not a lily, nor is it even of vegetable nature. It is an animal, although, like a plant, it has a long stalk. The animal is one allied to the star-fish, and has for its proper name that of *Encrinus*. It belongs to the great group of Echinoderms, which includes, as you know, the sea-urchins as well as the star-fish. The majority of these are not stalked at any stage of their existence, nor is this one always. As you see it in this slab the "flower" is closed, but, during life, the animal could expand its long delicate arms and make them wave about in the water. Sometimes it stood erect, and at others hung down from a rock. Its stem, which was much jointed, might be very long, even as much as eighteen feet. At its top was the animal's body or cup. Encrinites are common in their fossil state, but most of them rare in their living condition. Ray Lankester tells us that not more than a dozen species or so are now living. One of these occurs on

our British coast, and may reward the search of any one visiting our southern shores, especially those of Ireland. In that instance the animal is very small (quarter of inch long), and is fixed on a stalk only during its youth. After a while its stalk withers and breaks, and the "lily" swims away as a well-developed "Feather star-fish." It was, in its first state, a *Pentacrinus*, it is now *Comatula rosacea*. It has still a tendency to cling to stones by the aid of a sort of foot which it has grown. The little discs of which the jointed stem is made up are common as fossils. I show you a box full. If you find the word encrinite too long for daily use you may call them crinoids, which comes to the same thing. We have many other specimens in the Museum showing encrinites in different stages and conditions. Many encrinites probably date from the Jurassic or Carboniferous ages. They abound also in the Oolite and Lias. One of the largest of existing species is known as the *Caput Medusæ*, on account of its long slender arms. Krinon is Greek for lily, and a very similar word is Latin for hair, and it is a little doubtful as to which is the root of the name encrinite.

ABNORMAL GROWTH OF A DAMAGED HORN.

THE appended illustration gives a very graphic exemplification of contortion from want of support. It may be assumed that the under part of the left horn had been injured near to the skull, possibly by a bullet. The continued growth of the upper two-thirds, uncontrolled by corresponding growth of the under third, has had the result of pushing over the horn in a downward curve. The weight of the horn, for it was probably of considerable growth before the injury was inflicted, may have had some influence in determining the downward direction. The cruel result has been a complete closure of the mouth, the lower jaw being firmly locked against the upper.

The skull is that of an ibex. The animal was found dead in a mass of avalanche rubbish. The photograph was obtained by Major St. G. Gore, R.E. Death had probably been brought about by slow starvation. The normal horn was somewhat shorter than the injured one, but the latter at its base measured in girth two inches less than its fellow. In the figure it is shown to be much smaller, which gives support to the suggestion of injury.

In order to understand the manner in which this condition of things has been produced, and to gain its full lesson, we must begin by a brief explanation. The hollow horns of an Ibex, like those of other cavicorns, grow during the first part of the animal's life by deposition of new material at their bases. They are placed upon bony cores which spring from the skull, and which give the horn support. The tip of the horn is, of course, always the oldest and hardest part. It has been pushed forwards by layers of new material at the base. Now if any injury is received by the skull at the base of the horn-core, it may interfere with and prevent the formation of the

new layers. If this injury occurs on one side only, the growth taking place henceforth on one side in excess of the other, the horn will be turned over in a curve towards the weakened part. That is what has happened in this instance. The injury was doubtless received in youth, a bullet possibly fired from behind having carried away the inner and under part of the horn-core at its root. By slow degrees all the rest would follow.

We may note that the growth force residing in the living structures at the root of the horn were quite independent of the animal's control. There was no power resident in the animal's system, or external to it, which could interfere with the natural tendencies of these structures and constrain them to develop only in accordance with the interests of the whole. Nature affords us many illustrations of her modes which it might be wise for us to take heed of in respect to social affairs. In the body politic enlightened intelligence supplies the place of the controlling power which was so lamentably absent in the case before us. The sources of political power reside, however, as in the case of the horn, in the living elements which constitute the population, and it is obviously possible that any section of the latter may, in ignorance, use its power in a manner contrary to its own interests. Our shaft is, of course, aimed at all ill-informed exercise of power, and if it hits the neo-malthusians, or the ultra-socialists, or both, we cannot help it. In either case it is just possible that projects may be pushed forward with ignorant energy out of their proper curve, and greatly to the prejudice of national life in the future. We plead for thoughtfulness and sense of responsibility. The forces of Nature, beneficent as in the main they are, may yet be called blind and inexorable, and what is once done can seldom be wholly remedied.

[We are indebted to the courtesy of the proprietor of *The Field* for the loan of the block.—Ed. *Mus. Gaz.*]

SEASONAL NOTES.—FEBRUARY.

The only one of our copse trees which flowers whilst leafless is the hazel. It produces the buds of its male flowers (catkins) even in autumn, and if the weather be mild these may open and shed their pollen as early as January. There will, however, be a succession of them until May. This year the male catkins have been exceedingly abundant and some were ripe in the second week of January. One or two female flowers were brought to the museum as early as the 14th. Those who wish to find the inconspicuous female flower at this season must not lose time by searching promiscuously, but must choose a bough upon which the male florets have opened. On that bough the appearance of the female flower will not be long delayed. It affords an interesting example of individual peculiarity even in branches. The whole of one branch may exhibit this proclivity to early flowering whilst the rest of the tree is waiting patiently. A great many of the male catkins show the injurious effects of insect attack. They become brown at their tips and the scales are dry and prematurely open. A little grub will be found lodged in the middle of the part which is thus spoiled.

This month, like the preceding one, is not productive of many wild flowers. The red and yellow Deadnettle, Groundsel and Daisy may be found in sheltered spots, together with all the species alluded to last month. In the last week, if the season is mild, the Dog's Mercury and Coltsfoot will appear. The former is diœcious, having the male and female flowers on separate plants. The Coltsfoot flower appears before the leaves. In 1823 the following note appeared in *Time's Telescope:* "A remarkable fact never yet noticed by any author, may here be mentioned concerning the Coltsfoot; wherever the earth from canals, roads, &c., is thrown up from the depth of five or six feet, or more, below the surface, in every

part of England with which the writer has been acquainted, soon after its being so thrown up, Coltsfoot is found growing in more or less abundance. In all probability the seeds of this plant have remained dormant for ages, till brought up by this process to the surface, when light, air, heat and moisture prompt their vegetation."

A spell of mild weather frequently tempts some birds into thinking that spring has really come, and often the mistake ends in sorrow. Blackbirds, thrushes and robins are very prone to carelessness in reading the calendar. Given a few sunny days and they commence nesting; by the time the eggs are laid the cold weather has returned, and by the end of the next week, if the thermometer continues low, the nest is abandoned. Sometimes mild conditions obtain long enough for the eggs to be hatched, but two or three days' severe weather brings about the death of the young birds. They die of starvation, their parents being unable to obtain food for them. A great many more birds die in winter time of starvation than of actual cold.

The Raven, if not the first, is one of the earliest birds to nest in this country. Its nidification commences late in February. The Tawny Owl also nests early, and with both the young are hatched before the middle of March. These birds are not like the robins and thrushes, dependent upon insects and worms for food. They are carnivorous, and consequently are not at a loss to obtain food for the family even in severe weather. If no rodents are abroad they prey upon small birds, and the raven is by no means averse to a diet of young lamb.

On March 2, 1905, four eggs of a tawny owl were found upon the ground in a wood near Haslemere. The eggs were simply placed amongst the dead bracken in an open spot. This owl has also been known to nest in rabbits' burrows. Rooks return to their nesting places late in the month. Partridges pair, and pheasants establish their harems.

The mycologist may find much of interest even in February. Upon decaying stumps and logs, and especially on the cut surface of oak, may be found *Panus stypticus*, so-called from its astringent qualities. Pliny gave it the generic name. It is a little yellowish-buff fungus, not exceeding an inch in diameter, provided with a very short lateral stem, from which the cinnamon-coloured gills radiate. The substance is tough and leathery. The spores are white. Usually many specimens grow together. Other fungi of common occurrence on oak stumps are *Stereum hirsutum* and *Polystictus versicolor*. The former appears as golden-yellow velvety patches, often of large size, usually growing close upon the wood or bark; if its edge is free the upper surface is hairy and more or less zoned. *Polystictus versicolor* is one of the most cosmopolitan of fungi. As indicated by the generic name, it belongs to the *Polyporus* group, the white hymeneal surface being studded with minute holes, like pin-pricks, the sides of these tubes are lined with the spores or seeds seated on little stalks (*basidia*). The upper surface is of varied colour, always elegantly zoned. One of the most beautiful of our native fungi may now be found growing on dead sticks amongst moss in damp situations. We may call it the Scarlet cup.[1] It is shaped like a saucer about one inch across, usually less, is carmine within and white without, with a hairy white stem of variable length. In some parts of Yorkshire and in the western counties it is brought into the towns by gipsies and sold for decorative purposes. Occasionally specimens may be found with a cream-coloured instead of red disc. It prefers clay or limestone soil.

The fact that the number of fungals now to be found is limited makes February a good month in which to commence a collection. We have given at p. 444 some hints as to their preservation. It is, however, an excellent plan to make

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[1] *Peziza coccinea* or *Geopyxis coccinea*, see Massee's "British Fungus Flora," vol. iv., p. 377.

sketches. First take the whole plant or sporophore, and then its several characteristic parts, making a special drawing of each. If you are not much of a draughtsman you will find the practice improving and by no means wholly disappointing. If, however, neither ability nor leisure permit, then be content to find, gather, describe and identify, making a list as you go on. Each month will add to your collection, and not so fast as to be embarrassing. We shall month by month do our best to give assistance.

Though many molluscs hibernate in winter, several species may be found at this time of year awake under logs and stones in sheltered woods. It is, however, no use looking for them on the greensand soils, which are always inimical to molluscan life. In the latter part of January the writer, accompanied by a young friend interested in conchology, visited one of the known haunts of *Helix obvoluta*, an extremely local species, hoping to observe its manner of hybernation. Many bleached shells (64) were found on the surface soil in various parts of the wood, but much digging and scooping at the base of the beeches and hazels failed to reveal a single living specimen. The same with *Ena montana*. Two or three *Clausilia laminata* and *C. bidentata* (dead shells only) were observed. The scarcity of these usually common species is noteworthy. Bleached shells only, of *Helix aspersa*, *H. nemoralis*, *H. hortensis* (one with B. F. 00300), *H. arbustorum* and *H. lapicida* occurred in plenty. Several living *Clausilia rolphii* were obtained. Other living molluscs taken during the day were *Helix rotundata*, *H. rufescens*, *Vitrina pellucida*, *Vitrea alliaria*, *V. pura* and *V. crystallina*; also the slugs *Agriolimax agrestis* and *Arion fasciatus*.

The present time is favourable for the study of lichens. A lichen well exemplifies a condition variously termed symbiosis and mutualism, in which two plants originally quite distinct have, with the loss of some individuality in each, arrived at that happy state in which both are able to flourish

together and form what might be considered a hirdt plant possessing features not observable in the two separately considered.

A lichen is a compound of a fungus and an alga, the latter is the host and the former its parasite. The so-called "gonidia" of lichens are the algal parts and the fruit the fungal portion of the plant. The fungi concerned in the formation of lichens belong, for the most part, to that group in which the spores are enclosed in capsules (*asci*), the *Ascomycetes*. The fungi are much more abundant, as regards species than the algæ which enter into partnership with them. Hence it is very probable that one alga may combine with the hyphæ of several fungi. It is not unusual to find five or six lichens of different species growing on a stone no bigger than a brick.

It is not the seaweed group of algæ that effect this remarkable union with fungi, but minute species (frequenting walls, bark, &c.), requiring but little moisture, and capable of drying up without injury. In fact desiccation is an advantage, it assists their dispersal by wind. Fungus spores are also easily dispersed by the atmosphere. Distribution may also be effected by wind transportation of combined algal and fungal elements, daughter colonies or "soredia" as they are termed. They consist of green algal cells surrounded by hyphæ, the whole so small that a mass of them resembles a powder lying on the old lichen thallus. "The partners in the lichen communities appear to be, on the one hand, groups and filaments of round, ellipsoidal, or discoid green cells belonging to plant species included under the general name of *Algæ*, and on the other hand, pale, tubular cells or hyphæ, which are destitute of chlorophyll, and pertain to species of plants comprised under the general name of fungi" (Kerner). There are numerous species, assuming great variety of form. We have: (1) Crustaceous lichens which encrust wood, bark and stones. (2) Foliaceous lichens, resembling leaves with irregular, wrinkled margins. They are usually joined to the matrix

by root-like processes, and are not at all firmly fixed. (3) Fruticose lichens, shrub-like, with many-branched, more or less circular stems. (4) Beard lichens, many-branched and slender threads often found hanging from branches of trees. (5) Gelatinous lichens consisting of dark green tortuous masses of jelly, somewhat superficially resembling certain fungi of the order *Tremellineæ*, but always differing in possessing chlorophyll.

THE DESERT TOMBS OF BAHREIN.

THE *Desert Tombs of Bahrein* (an island in the Persian Gulf) are said to constitute the most gigantic cemetery in the world. Captain Prideaux, C.I.E., has been lately carrying on excavation work in the island, and has collected many fragmentary relics. The *Times* (January 26) remarks "Primitive civilisation first began in this region in all probability, and possibly this desert sepulchre is the oldest piece of man's handiwork now existing in the world. The mounds nearest to the village from which the necropolis is approached are 50 ft. high, but the vast sea of mounds beyond is made up of tombs from 20 ft. to 30 ft. in height. The few excavations so far made, confined to the higher mounds, show that each tomb consists of two large chambers, one above the other, built of vast blocks of stone. There are side chambers and passages, and the interior is neatly covered with layers of cement. First, the chambers must have been constructed, and then the tomb was covered over with compact layers of earth and small stones, very many feet thick, thus forming a mound capable of withstanding the flight of many ages, and not giving the slightest hint of what lies within. The masonry is cyclopean in character and perfect of its kind, but no marks of masons' tools are discernible. Not a vestige of an inscription has been discovered anywhere." Mr. Theodore Bent thought the mounds were of Phœnician origin.

NATURAL HISTORY NOTES AND EXTRACTS.

Clay-with-Flints.

On some parts of the chalk downs, occurring in isolated patches, but never forming large and even beds, may be observed a peculiar deposit of stiff brownish clay, containing a large number of unworn flints, and sometimes flint pebbles and quartz fragments. Such a deposit may be observed on the chalk hills around Hawkley, near Petersfield, and in many other places. Its thickness is very variable, in some places not exceeding a foot, in others not far removed the clay may be 25 feet high.

The origin of this deposit has been described by Mr. W. Whitaker, F.R.S., in his well-known work on the "Geology of London." We quote the following paragraph from page 282:—

"Clay-with-flints is of many ages, and may be forming even at the present day, and that it is owing in great part to the slow decomposition of the chalk under atmospheric action. If a chalk district were exposed for thousands of years, as many such districts must have been, to the action of rain, &c., the result would be that the carbonate of lime would be slowly carried away in solution by the carbonated water flowing through the cracks and joints of the absorbent rock, and leaving behind the insoluble compact flints and a great part of the earthy matter and iron. To these would be added the clayey and loamy wash from the Tertiary lands, and the remains of beds of that age left in pipes and hollows in the chalk. . . . The clay and flints left by the dissolution of the chalk would be present almost everywhere, whilst the loamy materials that would be formed from the lowest Tertiary beds would most likely be more local. The fact of the clay-with-flints occurring only on the chalk-with-flints is in favour of this view, and it is perhaps owing to the comparatively

small amount of more or less flat surface taken up by the chalk-without-flints that there is no such deposit upon it."

Mr. Whitaker remarks upon the vein of black clay, only a few inches thick, which lies at the base of the above and directly above the chalk. It contains black-coated flints. The blackness of the clay has not been satisfactorily explained.

Dislike of Rats for Guinea-pigs.

The guinea-pig is at the time of birth well advanced in development and will run about and eat before a day old. Some of its milk set of teeth have already been shed.

There is a widespread belief that both horses and rats have a dislike to guinea-pigs. Horses will not go into a stable in which they hear the squeak of these little rodents. If a horse be kept in a stable in which they are he will get used to them and manifest no further distrust, but rats, being free to move, always leave the place. Whether in them also in some cases familiarity may remove fear or breed contempt, we do not know. If it does not, the fact may perhaps, under some circumstances, be made of practical use. Guinea-pigs are of course exotics, and our English animals have had no opportunities for becoming hereditarily accustomed to their peculiar utterances. It is probably the unknown which excites fear. The British Fauna, whether wild or domesticated, is for the most part comprised of very reticent individuals, but these little Guianian importations never fail to make their presence known if they hear footsteps and are with difficulty persuaded to be still.

Distinction between "Domesticated Sheep and Goats."

The following is copied from a British Museum label :—

"Domesticated sheep generally, if not invariably, differ from goats by the presence of a gland on the face (the 'larmier' or tear gland) below each eye, and by the absence of a beard on the chin of the males. In domesticated goats the beard is often present in both sexes. Rams also lack the

strong odour of he-goats. Sheep have glands (interdigital glands) between the hoofs of all the feet, but in goats such glands are always wanting in the hind feet and may be likewise absent in the front pair. The horns of sheep (when present) generally form a close horizontally directed spiral, with numerous fine transverse wrinkles and are brown in colour. Those of goats are usually blackish, directed more upwards, and may be either scimitar-shaped or corkscrew-like. The Wallachian sheep has, however, upwardly directed corkscrew-like horns. The skull of a typical goat differs from that of a typical sheep by the absence of a pit for the facial gland, by the circumstance that the part behind the horns is rounded instead of flat and meets the frontal plane at a very obtuse, instead of nearly at a right angle, and by the more concave profile of the forehead. There are, however, hornless, Roman-nosed domesticated goats without a beard, and wild sheep without face glands, so that it is difficult to distinguish between all the members of the two groups."

Toads and Natter-jacks.

The natter-jack is spotted, has a yellow streak down the length of its back, is smaller than the toad, and is a somewhat less loathsome animal. The habits of the two are very similar. The common toad is *Bufo vulgaris*, the natter-jack, *Bufo calamita*. To the toad many adjectives have been applied, such as *teneatus*, *cinerius*, *palmarum*, *&c.*, whilst in vulgar speech it is the common toad, or the paddock. The natter-jack is locally known as the walking toad, the golden back, and the mephitic toad, more learnedly as *Bufo cruceatus*, *B. portentosus*, *B. viridis*, *Rana fœtidissima* and *R. mephitica*. These adjectives suggest that excepting in the possession of the yellow streak and spots there is not much to choose between the two animals.

Although in popular phraseology toads stand as the type form of reptiles, in the classification of the naturalist they are not reptiles but amphibians (batrachians). They are

much nearer to fish than true reptiles are, being in their early, or tadpole, stage provided with gills and able to breathe under water.

True reptiles are land living animals and require to breathe air. They undergo none of the metamorphic changes which are so interesting in the case of frogs and toads. Snakes, lizards, tortoises, &c., are Reptiles, that is, belong to the class *Reptilia*.

Cuckoo Notes.

Some interesting notes on the origin of parasitic habits in cuckoos were contributed to the *Emu* last year by Mr. C. L. Barrett, of Melbourne. It is stated that one American species sometimes lays in the nests of other birds though it usually prefers to build its own nest and hatch its own eggs. Five species of the Indian hawk cuckoos (*Hierococcyx*) lay in the nests of babbling thrushes, but the sixth makes its own nest. Mr. Barrett cites a theory that the food of the nestling cuckoo has an influence in determining the colour of the eggs it may subsequently lay. He remarks, "If such be the case, it goes far to explain the similarity between the eggs of many species of cuckoos and those of their foster parents."

The two following paragraphs are quoted from "The Early Life of the Young Cuckoo," by W. Percival Westell :—

"I have always found the hedge-sparrow to be charged with the rearing of the great sprawling youngster more than any other bird, and I well remember one lucky day in Bedfordshire, some six or seven years ago, finding half-a-dozen of these nests in one morning, each containing an egg of the cuckoo. Other favourite foster-parents are the robin, meadow pipit, whitethroat, reed warbler and pied wagtail. The egg is laid on the ground and carried to the selected nest in the bird's beak, not in the claws as has been erroneously stated. It is the smallest egg laid by any British bird in comparison to its size, being very little larger than a house sparrow's, or perhaps, almost the size of a skylark's. In its colouring the egg varies a great deal and columns might be devoted to this

alone. In the collection at South Kensington there are three varieties of blue cuckoo's eggs which were laid in the nests of the hedge sparrow, redstart, and pied flycatcher, all of which lay blue eggs !

"The young cuckoo has a depression in the back, which gives a more secure lodgment to the young bird or egg it wishes to eject, and the back is broad considering the size of the bird."

On Abnormal Shells.

We quote the following interesting observations from Dr. Chaster's presidential address, at the last annual meeting of the Conchological Society (October, 1906):—

"The various deviations from the normal that are produced by direct injury or by disease are worthy of mention. These we may perhaps call pathological. In the case of some long, slender shells the apex has so frequently and for so many generations been subjected to injury, that at length the species has acquired the habit of making preparation for it. In *Turritellæ*, for example, the apical one-fourth or so of the shell will be found to be unoccupied by the animal, which has shut off the upper whorls by a series of successive septa occurring about every half-turn. In *Truncatella* and other forms the process is carried still further, for, before the septum is made, the shell about to be vacated is so thinned that it is soon broken off and the adult is always decollated."

Potato Disease.

There are some interesting notes on *Phytophthora infestans* in the seventh issue of the *Kew Bulletin* for last year. "Experiments prove that tubers can only be infected during the earliest stage of growth; when the tuber has reached the size of a marble and a definite periderm or skin is formed it is free from danger. Judged from a morphological standpoint, the relationship of the fungus causing 'leaf-curl' to that of another fungus—*Macrosperium tomato*, Cooke, parasitic on cultivated tomatoes—was some years ago indicated as follows: 'This fungus is closely allied to if not identical with, the *Macrosporium* causing black stripe or blotch on the tomato' ('Textbook of Plant Diseases,' p. 323). Inoculation experiments have proved this supposition to be correct. Conidia produced

on a potato plant will infect a tomato and *vice-versâ*. The discovery facilitates matters to the extent of deleting one supposed parasitic entity, and also indicates the danger of the disease passing from one crop to the other when the two are growing in close proximity. The practical deductions to be derived from the foregoing remarks are as follows: (1) Potato tubers for planting should be obtained from a district free from disease; (2) potatoes should not be planted for a period of three years on land that has produced a diseased crop; (3) diseased haulms should be collected and burned or deeply buried: this is important, otherwise the land will become infected; (4) diseased tomato stems and fruit should be dealt with as above, otherwise the potato crop may suffer."

Some Miscellanea.

The suggested explanation of the fact that the gorilla, the chimpanzee, and the orang-outan resemble each other very closely whilst they differ conspicuously in certain points, is that they are descended from a common parentage, but have become differentiated by isolation in the long lapse of time.

The dormouse, *Muscardinus avellanarius*, is more nearly allied to the squirrels than to mice. Dormice differ from all other rodents in having no cæcum.

The Grinders of Extinct Elephants.—The Mastodon had grinders resembling those of the African Elephants; the Elephas, primigenius, like those of Indian Elephants.

All Social or Folk Museums should contain collections of Pewter utensils. A Pewterer's Company was incorporated in London in 1473. *Pewter* is made of tin with a little lead to soften it. Common pewter is dangerous with acid fluids, (wine or vinegar), since the lead may be dissolved. The finest pewter consists of tin 12, antimony 1, and a very little copper. Common pewter has tin 80, lead 20. Britannia Metal is a hard form of "pewter." It contains no lead.

Our collection of Pewter at Haslemere is as yet very small, a fact of which we hope that our friends will kindly take note.

FUNGUS DISEASES OF VIOLETS.

A NOTE upon this subject seems desirable, as from many districts we have received complaints of violets suffering from "disease," some gardeners asserting that it is almost impossible to grow them. The term "disease" is a vague one, and probably often includes several parasites, though as far as Haslemere is concerned, all diseased violets brought to the Museum for inspection, have been infested with the Spot Disease (*Cercospora violæ*). There are three fungi parasitic on cultivated violets, and three on wild ones. These we will very briefly allude to.

VIOLET SPOT DISEASE.

Cercospora[1] *violæ*, Saccardo.—Causes dry whitish spots on the leaves of the sweet violet, *Viola odorata*, especially when grown under glass; but we have seen it in great plenty in gardens in the west of England, and it is very prevalent around Haslemere. Treatment: spray with dilute Bordeaux mixture.

Water	50 gallons.
Copper sulphate	6 lbs.
Unslaked lime	4 lbs.

For adhesive properties add 6 lbs. of soft soap.

When grown under glass, great care should be observed to keep the houses or frames clean, and to select for the cutting bed only strong and vigorous plants entirely free of disease.

AMERICAN VIOLET SPOT DISEASE.

(*Alternaria violæ*) causes greenish or yellowish-white spots, or even pure white ones, on the leaves of cultivated violets. In the very young state it resembles the bite or sting of an insect, at maturity the ring is $\frac{1}{4}$ inch in diameter with a central light-coloured spot, with more or less numerous alternate rings of dark and light tissue. It is the presence of this central spot which *superficially* separates this disease from the ordinary violet spot of this country.

Excessive cultivation in all probability produced a weak

[1] To this genus belong the "shot-hole" fungi of the leaves of celery, and peach, apricot, &c.

strain which became susceptible to the attack of the parasite. We do not know if it has been recorded for Great Britain; apparently it is closely allied to the preceding species. It is described in detail in the twenty-third *Bulletin of the Department of Agriculture, U.S.A.* (1900).

VIOLET-MOULD.

Peronospora violæ, De Bary, causes a dense pale violet-grey mat on the under surface of the leaves of the common Hearts-ease (*Viola tricolor*), and those of the cultivated Neapolitan violet. It is most abundant in damp weather. The oospores are formed late in Autumn in the dying leaves and parts of the host.

It is said that no liquid fungicides have been proved to be beneficial, the potassium sulphide spray (water 2½ gallons, potassium sulphide 1 oz.), being the best. Plenty of air and little water checks the spread of the disease.

Does *Peronospora violæ* occur on pansies? These plants being cultivated forms of *Viola tricolor*, it is curious if they have resisted the attacks of fungi. There may be fungus diseases of the pansy on record, but there is no mention of such in Massee's "Text Book of Plant Diseases."

The following diseases of our native wild violets are recorded in Dr. Plowright's "British Uredineæ and Ustilagineæ."

Puccinia fergussoni on *Viola palustris*. Sori crowded in orbicular clusters, forming yellowish or pale spots. (Scotland and Wales).

Puccinia ægra on *V. lutea, var amæna,* and *V. cornuta;* forming *scattered* pseudoperidia, with torn, white, partially recurved margins.

Puccinia violæ on *V. canina, odorata, tricolor, hirta* and *sylvatica.* Very common from May to October. The Æcidiospores cause yellowish-white patches on the leaves and stems, often distorting the latter very much. The sori of the teleutospores are black, round and small. Does it ever occur on cultivated violets?

CORRESPONDENCE.

TO THE EDITOR OF THE "MUSEUM GAZETTE."

SIR,—If you think the following of sufficient interest to put in the MUSEUM GAZETTE I should be glad if you did so.

On November 25 last, about mid-day, I was walking with a friend on one of the Llwynmadoc hills called Carnwen. Its beautiful form, with the peak on the top, attracts the attention of all visitors to this neighbourhood, which is in the north of Breconshire. On the south side of Carnwen is a narrow, deep and beautiful valley in which stands Llwynmadoc. On the north side is another deep and narrow valley through which flows the Cammarch, emptying itself into the Irvon at Llangammarch. We were near the top of the hill, looking at the mist slowly moving down this valley, when the sun suddenly shone, and on the mist below appeared a beautiful miniature mist rainbow. Where the sun's rays pierced the mist there was a bright glow of red and yellow, and above, two arcs or circles of most brilliant hues. In the centre was a small dark shadow which we were at a loss to account for until we moved, when we found it was our own. We were filled with wonder and delight as we gazed upon this lovely scene, which lasted for about eight minutes. Is it of rare occurrence in this country?

Beulah, *Breconshire.* JOHN PRICE.
January 15, 1907.

EDUCATIONAL MUSEUM. A DEFINITION.—A collection of objects arranged and described with the special object of enabling the unlearned to acquire information easily.

LOW POWER MICROSCOPES.—Messrs. Beck, of Cornhill, inform us, in answer to enquiry, that their Star Microscope for low power work is one which with the sliding body No. 40, and a low power objective comes out at £2 5s., as marked on p. 15 of their catalogue.

The better form of instrument, with rack and pinion coarse adjustment, No. 42, comes out, with one eye-piece and one object glass, at £3. This is figured on p. 17 of their catalogue.

SEA-WEEDS AND CORALLINES.—Although, in a general way, seaweeds are easily distinguished, there may be, it is to be admitted, some difficulty with the true corallines. These curious productions are sea-weeds which encrust themselves with lime. If placed in dilute sulphuric acid the lime salts are dissolved away, and the

vegetable structure becomes obvious. These corallines are abundant on the English coast, but not very conspicuous. They often grow almost after the habit of a lichen on the surface of a stone, or they may be found in rock-pools, constituting short tufts.

THE ARCHEOPTERYX.—"It cannot be said that this ancient extinct bird goes far towards connecting birds with reptiles, but in the possession of separate claw-bearing fingers, a long bony tail and teeth, in the apparent want of a beak, it does come nearer to lizard-like reptiles than does any other known bird."—RAY LANKESTER, 239.

THE atmosphere is forty-five miles in height. If it were throughout of the same density as at sea-level it would be only about a ninth of that height (or five miles). Air is 810 times lighter than water and 11,000 lighter than mercury. Pressure, 15 lbs. on the square inch.

IN a recent number of *Nature* we notice an advertisement offering £5 17s. 6d. per ounce for old platinum crucibles, &c.

The same weight of this metal was worth about £1 15s. in the year 1880.

The present high price of platinum is due to its extensive use during late years in the platinotype photographic process, which has created so great a demand for it that all the known sources of supply threaten shortly to become exhausted. This costly metal is found in Borneo, some of the western states of America, Canada, Australia, and a few other places. The chief locality, however, is the Ural Mountains in Russia. It almost invariably occurs in association with various other rare metals, one of which, viz., osmium, is the heaviest of all known substances, platinum being only slightly lighter.

Crucibles, spatulas, &c., made of platinum, are much used in chemical and physical laboratories, the metal being especially suited for such purposes on account of its high melting point, and also by reason of the properties which it possesses of remaining unoxidised by the atmosphere at all temperatures, and being unacted upon by acids.

THE editors of the *Naturalist* say of the Selby Museum: "We are sorry to see from a report of an address recently delivered at Selby by Mr. Hutchinson, that this Museum is not appreciated as it ought to be." This statement is an error, for nothing of the kind was suggested. The Museum is exceedingly well appreciated, and so well visited that its charge of a penny admission almost, if not quite, pays the cost of maintenance. What was said referred solely to the local collection, and the regret expressed was that classes on special

subjects had not been organised, and more done in museum teaching, the maintenance of a vivarium, and in the way of botanical and geological excursions, &c. It was said in the hope of stirring up local zeal, and it has, it is believed, to some extent attained its end.

TO THE EDITOR OF "THE MUSEUM GAZETTE," HASLEMERE.

DORMAN MEMORIAL MUSEUM,
MIDDLESBROUGH.
February 4, 1907.

DEAR SIR,—In reference to your note on the Straits of Dover in the May number of your Journal, I would like to call attention to another view of their origin. This view, first propounded by Belt and supported by Professor Kendall, is that they are the channel cut by the discharge into the sea of a vast system of glacier lakes in Britain and on the Continent during the Ice Age. At the period of the maximum extension of the ice in Britain, the drainage of the rivers was dammed up by the glaciers, and lakes formed, which overflowed across the surrounding valleys' sides, cutting deep and very characteristic channels. Of these the Straits constitute one. Moreover, Mr. Kendall has been able to trace a succession of overflows from North Yorkshire to the Straits of Dover; thus commencing here, we find that Eskdale was dammed up and overflowed by Newton Dale into another great Lake held up in the Pickering Valley. This in its turn escaped by the present course of the River Derwent at Malton, which is in reality the old overflow of Lake Pickering. This latter lake fell into Lake Humber, a great extra-morainic sheet of water in the central plain of England, produced by an obstruction of the Humber and the rivers flowing into the Wash. Lake Humber drained across Norfolk by the valley in which the Little Ouse and Waveney arise, thence the flow continued to the Straits of Dover, which represent the combined erosion of the drainage of this extraordinary system of lakes.

I am glad of this opportunity to call attention to the great services done to glacial geology by Professor Kendall, of the Leeds University, and for further information refer readers to vol. lviii. of the *Quarterly Journal of the Geological Society* for 1902, where a full discussion is given in his famous and classic paper on "A System of Glacier Lakes in the Cleveland Hills."

Yours faithfully,
FRANK ELGEE, *Assistant Curator.*

THE

MUSEUM GAZETTE.

No. 11. MARCH, 1907. Vol. 1.

EDITORIAL NOTES.

Last summer we devoted two issues of our Gazette to seaside topics, and in the autumn one was given to the study of fungi. March and April are the months for Mosses, and we accordingly allow this most interesting tribe of plants to take up a large share of our space. The Rev. E. N. Bloomfield, an authority on mosses, has kindly written for us a short but valuable article, and for the benefit of beginners we have, in our Lexicon page and elsewhere, endeavoured to clear the subject of some of its difficulties, by the familiar exposition of some of the terms in use. It is a mistake to suppose that the study of mosses has in it more of the abstruse than is inherent in all branches of natural knowledge. It is, on the contrary, one well within the reach of all.

The beginner in the study of mosses may be advised to begin by collecting a few common specimens and keeping them for a time alive. A moss-vivarium takes up but little room, and is not unsuited to the window sill of any room. A few shallow saucers and a bell glass or two are all that is needed, and the latter are not indispensable. At page 500 a list of sixteen species is given with short descriptions. This

list is designed for use as labels, and we can supply it as a slip, printed only on one side, for cutting up. The mosses named are all common ones.

In collecting mosses for purposes of identification only, it is not necessary to wait for their "fruiting." For minute distinctions and for systematic arrangement the "fruit" is essential, but a great number may be known and admired for their leafage only, and are recognisable at almost any season of the year. For study of this kind a vivarium is infinitely preferable to dried specimens. We shall probably add to our list of labels in an early number.

Apropos of what we have written on Museums at p. 421, it may be urged that a most important addition to the usefulness of a museum of whatever scope, is a Catalogue. This must, of course, be adapted to the scope of the museum. It is impossible to praise too highly the catalogues issued by the various special departments of the British Museum. The only wish which they leave unfulfilled, is that there were more of them. They are full of modern knowledge and are most useful additions to all museums. They are not, however, nor is it to be desired that they should be, what is wanted for an Educational Museum. Some of our large provincial museums have their own catalogues, but they are seldom complete, and almost never kept up to date. For Educational Museums it would be quite feasible to prepare a catalogue which should be adapted for all, and thus save expense in printing, and labour in preparation. It would also be of great value as indicating what objects should be collected. We commend this most useful task to the attention of the Museums' Association.

It is possible that we have a link of evidence as to the relationship between the nuthatch and the woodpeckers in the habit of the young of both to hiss. Those who have heard a nest of young woodpeckers, deeply ensconced and

entirely concealed in a hollow trunk, hiss like so many snakes when disturbed, will never forget the weird effect. It is said that the young nuthatch has the same habit. It is doubtless a protective attainment, for it is certainly well adapted to scare away any ill-informed intruders. We must admit, however, that not all birds that hiss are nearly related to each other. These two birds use the attainment only when quite young and whilst exposed to danger in the nest, and under circumstances which render it very likely to be effectual.

It has been pointed out to us by two correspondents (to whom our thanks are due) that a paragraph respecting the grinders of elephants, on p. 463, seems to suggest more than it says, and is liable to misconception. The points in which the teeth of the mastodons resemble those of the African elephant rather than those of the Indian are the lozenge-shape of the transverse plates as seen in the worn tooth, and their somewhat coarser structure. In the Indian, as in the mammoth (*Elephas primigenius*), the plates are straight-sided, whilst in the African they are lozenges, and in the mastodons they are irregular, and when worn down approach lozenges. It was not intended to suggest that this implied closer relationship between the mastodons and the African than between the latter and the Asiatic. There is no question but that both African and Asiatic elephants are generically distinct from the mastodons. It was, however, we thought, of some interest to note that in the African molar, certain mastodon features are preserved which are lost in the Asiatic.

Our note was prompted by the inspection of some fine specimens of these teeth, which are placed side by side in the Berne Museum. It is to be remembered that there were many mastodons, the teeth of which differed somewhat, and also that the pattern presented by the worn surface would vary with the stage of wearing.

The pedigree of the elephant has not as yet been determined with exactitude. The distinctions of genera and species are, after all, matters of convenience in classification rather than of nature. Between the genus *Mastodon* and the genus *Elephas* there were certainly blood relationships. Was the latter related to the former in direct line, or only collaterally? Which of the mastodons comes nearest to the elephants, and which of the elephants carries the fewest traces of mastodon relationship?

Several of the many fossil species of elephant approached the mastodon much more nearly than do either of the two surviving ones. Our distinguished English authorities remark that the transition is so gradual "that it is very difficult to know where to draw the line between the two."[1]

There is, of course, no doubt but that the genus *Mastodon* long preceded that of *Elephas*, and that the two, each represented by many species, lived contemporaneously for a time. Gradually in all regions *Elephas* supplanted *Mastodon*, or mastodons declined. Mastodon has now in all its species been long extinct, and so also have all the earlier types of *Elephas* which exhibited teeth resembling those of mastodon.

In the Museum of the College of Surgeons there is a good series of teeth of elephants and mastodons. No. 2,645, *M. angustidens*, shows features most like those of *Elephas africanus*, and 2,646 is not very dissimilar.

Elephas clifti and *Elephas bombifrons*, although their plates

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[1] "In the African elephant the molars are of coarse construction, with fewer and larger plates and thicker enamel."

Some extinct species "approach so closely in the breadth and coarseness of the ridges and paucity of cement to *Mastodon* as to have been placed by some zoologists in that genus."

"The stegodont group is peculiar to the Eastern parts of the old world, and connects the true elephants intimately with the mastodons."—Flower and Lydekker pp. 427, 431.

are almost straight, show in the depth of the intervening troughs features approaching those of mastodons.

For those, however, who cannot get to a Museum, the excellent illustrations given by Mr. Lydekker in the "Royal Natural History" will do almost equally well. It will be realised that for mastication purposes, the molar of either of our existing elephants has advantages of those of the mastodons. It will be seen also that in some features Clift's elephant approaches the mastodon type, whilst *Mastodon latidens* is nearer the elephant type than some others. It is an interesting speculation whether the progressive improvement in the efficiency of the molar teeth, as aids to digestion, may not have exercised an important influence in enabling the genus *Elephas* to supersede that of *Mastodon*. It is further not improbable that some change was taking place in vegetation which rendered the more level surface of the elephants' grinders of increasingly greater importance.

We have ventured to deprecate (p. 483) the too close association of Art Galleries with Museums. A Zoological garden and an Aquarium are, however, whenever practicable, very appropriate concomitants. It is, indeed, to be regretted that they are usually kept so far apart. It is not, of course, possible to bring a zoo into a museum, but to place a museum in a garden would be not only feasible but very appropriate. It has been attempted both in Paris and in London, but not, we believe, well carried out. Such museums should be in the main educational in type, should illustrate by drawings, photographs and skeletons the habits and anatomical structure of the animals. Perhaps, after all, the same objection which we have urged against art galleries would again apply here. The living animals would compete too successfully with the skeletons.

There is, however, a type of Zoo-Museum which we have never seen attempted, which might be made very attractive

and very useful in villages and small towns. Temporary or week-end exhibitions might be arranged, in which should be collected examples of all the domesticated and wild animals of the district that could be obtained. These should have a descriptive catalogue and explanatory labels, and should be accompanied by skeletons and pictorial illustrations. There are many features in the anatomical structure of our domestic animals which are well worth calling attention to and which would be best appreciated when the living and the dead were brought into juxtaposition. The skull, teeth, tusks, feet, &c., of *Sus scrofa*, the very remarkable lower jaws of the familiar Cavy, the differences in the teeth of our rodent pests and pets, and a hundred other objects may be mentioned. All the cottagers would bring birds and the school boys might be trusted to produce snails, newts, snakes and sticklebacks. Illustrations of variety in single species might be instructively shown and commented upon in dogs, cats, pigeons and fowls. The adjacent Educational Museum should supply the bones and the diagrams. Such an exhibition would attract the country-side and pay its own expenses. A well-prepared catalogue would serve not for one only but for many.

We have received from Mr. N. R. Edwards, of Cambridge, a list identifying sixteen of the Museum specimens in the photographic frontispiece of our February number. The list contains only three errors in names, none of them important, and we have pleasure in awarding the prize offered.

From Mr. G. Merriman, of 96, Finchley Road, we have received a very meritorious description of the skulls shown in the frontispiece for January. In addition to the description, the names are correctly given in most instances, and we have pleasure in awarding the prize offered.

AN INTERVIEW WITH THE EDITOR.

We wish to know, Mr. Editor, whether we ought to say Selt or Kelt?

It depends upon what you mean by the word. There are races of men known as Celts. I advise you to call them Kelts and to write them Kelts. There are certain little prehistoric implements known as Celts. These you had best call Selts and spell Celts.

By the way from when do we date "prehistoric" times?

It depends upon what you accept as historic data. The diligence of investigators is rapidly bringing much time that was considered prehistoric into the domain of history. Different nations and races also differ much in the length of time during which they have had a history.

But as to history of Britain, when do you say that history begins?

Well, as a landmark we may say that it begins with Julius Cæsar, that is, half a century before Christ.

Why do you fix upon Cæsar?

Because he was the first to make notes of what he found in Britain, and to leave them in a form which has come down to us.

Had no one, then, visited Britain before Cæsar?

Oh, yes, many. Merchants in numbers had sailed to Cornwall to fetch tin, and there had long been constant commerce between Britain and the Continent across the Dover Straits. It was the reports of these traders which impelled Cæsar and the Romans to desire to possess Britain; but no one had written anything in the form of a report.

How as to Tacitus?

His writings are most important, but they come a century later than Cæsar. There were, it is true, one or two incidental references to Britain prior to Cæsar's time, but they are very brief and open to some doubt.

If, then, we may say that for Britain history goes back only two thousand years, how do the dates stand for the more ancient nations—China, Egypt, Greece, Chaldea ?

We may for all these say that authentic history does not at present go back further than two thousand years before Christ, or about four thousand from the present time.

If, then, it be true that, as you insisted on the last occasion that we talked with you, human beings have been present in Britain for a quarter of a million years, the ages of prehistoric time must have been very long ?

Yes, the disproportion between historic and prehistoric is of almost inconceivable length. You have to subtract two thousand from two hundred and fifty thousand.

What do you suppose was doing during all those more than two thousand centuries ?

Man's brain was slowly increasing in size, and its case, the skull, was getting larger and of better form. The forehead was rising and filling forwards, and the intellect was developing. Speech was improving and manners undergoing amelioration. Animals were being tamed, and the supply of food was becoming more abundant and more varied. In a word, the human being was gradually becoming fitted to take advantage of future discoveries.

What was the great discovery which next followed ?

That of the use of metals. Hitherto nothing better than stone implements had been available. We may almost say that historic time, in all nations, dates from the discovery or introduction of the use of iron.

Why do you omit the "age of bronze" ?

It is probable that in some regions an age of copper preceded the art of making bronze, and it is certain that in most, a short period of bronze implements preceded the working in iron. These metals were, however, in sole use for only such insignificant periods, as compared with those of stone before and of iron afterwards, that we can afford to almost neglect them. They were interludes rather than "ages."

When do you date the first employment of iron?

We know that in Asia Minor iron was a novelty in the time of Homer. It is probable that in Egypt, Chaldea and China it had been known some ages earlier. If we say that there is no certainty of its use on any part of the globe for more than six thousand years, we shall not be far wrong. In Britain not more than three thousand.

Had the natives of Britain iron when Cæsar landed?

They certainly had both bronze and iron and were habitually using both. They had scythes fixed to their chariots, and used metal sickles to cut their grain.

What dates may be given for the bronze period in Britain?

From 2000 B.C. to the time of Christ, but during the latter half of this period the populations were bringing iron into use also. Thus we narrow the period during which bronze was common and in exclusive use to a short five hundred years.

A SPACE-FOR-TIME SCHEDULE OF THE BRONZE AGE IN BRITAIN.

In reference to the Space-for-Time Schedule which will be found on the next page, we are wishful to explain that it is tentative only. We stereotype nothing and have always great pleasure in receiving the suggestions of our readers. In the present instance we deal with a subject very wide in extent and complex in detail. We may have made mistakes and it is quite certain that we have omitted much that might have suitably been noticed. Our readers can supply for themselves emendations and additions, and should any of these seem to them important we shall be thankful if they will forward them to us. We may, in the future, reprint the Schedule with improvements. What details are forthcoming as regards clothing, food, the use of stimulants, religious observances, &c.? How was cremation carried out? These are only a few of the questions suggested.

TWO THOUSAND YEARS B.C. IN BRITAIN.

B.C.	
2000	[Avebury. Arbor Low (Stone Circle) were already there.] Neolithic Times. Picts (Iberians) in possession of Britain. Copper and tin worked by the Picts (Iberians). Bronze made about this time. No cremation of the dead. Long STONEHENGE CONSTRUCTED. [barrows.
1750	Population Iberian = Pictish (non-Aryan). Corn cultivated and cattle kept.
1500	Ornamentation of pottery in straight lines only. BRONZE NOW IN FULL USE IN BRITAIN. The barrows may contain drinking-cups and other vessels, but no urns. The barrows were long and they contain long skulls. Population still Iberian, *i.e.*, Picts.
1250	Beginning of the use of Bronze in Scandinavia. Population still Iberian or Pictish in Britain. Religion Drüidic.
1000	Advent of an Aryan population (Goidels or Gauls). EARLIEST CREMATIONS. Urns deposited in barrows. The barrows are round, and they contain broad skulls. Use of iron began in Britain, and that of bronze began to decline.
750	Pottery sometimes ornamented by curves or representations of animals. At this time the Solent was narrower and shallower than at present. At low tide waggons could cross (Lymington to Yarmouth).
500	IRON NOW IN GENERAL USE IN BRITAIN. Brythonic Kelts invaded Yorkshire (Gallo-Brythons), gave the name "Briton." Gallic Kelts pushed by Brythonic Kelts to the West and into Ireland. Pytheas of Marseilles supposed to have visited Britain. Time of Aristotle and Alexander (330 B.C.).
250	The Belgæ (half Teutonic) invaded Southern Britain. Timæus, Sicilian historian, mentioned Keltic tin, probably referring to British. The Dover sea route to Britain not yet Tin trade languishing (Polybius, 150 B.C.). [developed. British tin trade ceased. Posidonius travelled in Britain (90 B.C.). Cæsar landed. Cassivelaunus died, 47 B.C.; ruled north of Thames. Tasciovannus reigned about 30 B.C. His mint was at St. Albans (Verulam). Cunabellinus reigned 5 B.C. (Shakespeare's Cymbeline). Strabo, whose statements apply to this period, mentions wheat, cattle, gold, silver, iron, skins, slaves and dogs as exports from Britain.
A.D.	

MUSEUMS AND MUSEUMS.

The little contretemps which has just occurred between ourselves and the Editors of an ably conducted Natural History Journal in the North of England, has made it evident that misunderstandings are possible as to the terms by which Museums are designated. We propose, therefore, to offer for consideration, supplemented by explanations, a few definitions. We had written in an Editorial note, a strong expression of opinion that Local Museums are much less well adapted than general ones for educational purposes, meaning by the term "local" those which restrict themselves exclusively to objects collected within a limited radius. For this opinion we were taken sharply to task, and were told that there are in the North many flourishing "Local Museums" which are doing excellent educational work, and York, Chester and Perth were instanced as cities possessing "strictly Local Museums" of the best kind. Our personal knowledge did not include Perth, but respecting York and Chester, we knew that those cities possessed most excellent collections of instructive objects, but gathered from all parts of the world. It seemed impossible that our critic could be referring to them, but on enquiry we ascertained that no others existed. In each instance the museum is located in a city rich in Roman remains, and also a good centre for the collection of prehistoric objects, and naturally antiquarian exhibits have somewhat preponderated. In neither, however, has there been any exclusiveness, but quite the reverse. The word *local* has obviously two meanings, a general one and a conventional one. The York Museum is local because it is at York and not in London, but in the conventional sense—the one, we submit, in which the word *local* should be used amongst museum workers—it is not in the least applicable. It seems a pity that misunderstandings should needlessly arise amongst

those who are interested in the same pursuits, and accordingly we venture to submit our definitions and explanations.

We will take first the words which have caused the quarrel —*Local Museum*. All such should have a rule restricting the collection to local objects. The late Mr. Toynbee, who was an earnest advocate of museums of this kind, instituted one at Wimbledon, and wrote a valuable little book (long ago out of print) descriptive of their aims. They were intended to promote field study, and the exhaustive investigation of the natural history of the included area. In addition it was proposed to collect local history, old maps and engravings, to photograph the churches, public buildings, and anything and everything of local interest. It is obvious that so long as they are vigorously worked such museums must be invaluable in promoting local investigation, and accumulating topographical facts. It is, however, difficult, we believe, to make them prosper for long, and the line of argument which we have taken in advocating a large multiplication of museums for educational purposes has been, that whilst they should be general in scope they should have local sections, and endeavour in all ways to accomplish, in addition to their primary functions, the admirable objects which Mr. Toynbee and his followers had in view.

We have urged that the curator of a restricted museum of this kind is, as an educator, at great disadvantage. It is obvious that he is precluded from producing before his class a multitude of objects which are invaluable as material for instruction. He might, for instance, show the skull of a pig, but would not be allowed to produce for comparison those of the babiroussa, or the hippopotamus. What is yet more important, he could not leave these skulls, well labelled, to tell their own tale in his display cases. Local collecting is of value chiefly to the collectors themselves, for the herbarium and the little groups of local animals and birds seldom offer much to attract or instruct the outside visitor.

We cannot but think, however, that the whole ground is

covered when we have said that no General Museum should neglect to do its very best as regards local objects.

A *General Museum* is obviously one which does not restrict itself, but collects everything that is valuable and for which it can find room. It may develop special departments, and will do so in connection with the locality in which it is placed. It is a repertory of objects for scientific study, and it is of great value as offering a centre to which should gravitate everything of interest which residents in the neighbourhood may chance to secure either at home or on their travels. It should see that all its objects are properly labelled and described, but it does not necessarily undertake to make its treasures instructive to the uninitiated.

A *County Museum* is usually a large and prosperous General Museum, and even less than the latter does it undertake direct teaching, as distinct from and additional to efficient illustration. Such a museum may, however, very well provide an Education Department in a separate building or otherwise.

Metropolitan or National Museums are County Museums on a grand scale and are better endowed. They aim at completeness, pay good salaries, and supply to students examples of what they could not easily find elsewhere. They are, at the same time, eminently instructive and attractive, for their objects are often most beautifully displayed. Their aim is, however, the promotion of science rather than the education of the multitude, and it would be a great pity that in aiming at the latter anything should be sacrificed in reference to the former.

An *Educational Museum* is one which foregoes the ambition to advance science, and lays its plans to afford, by the display and description of objects, an insight into the knowledge of Nature and Art to those as yet uninstructed. For this purpose good typical objects are selected, and they are accompanied not only by untechnical descriptions and labels, but by maps and pictorial illustrations whenever desirable. Such a museum is designed not only to supply materials for the

illustration of popular lectures, but to enable the visitor by himself to inspect the specimens intelligently, and without further assistance to learn some of their lessons. Such museums should always have, in addition to their permanent display of objects, temporary collections of things of the season. For the most part such museums avoid all expensive objects, and do not seek after rarities. Objects which can be handled without damage and replaced without much cost are preferred. For such museums plenty of space is most desirable, but magnificent buildings and architectural display are to be avoided. They are museums intended to attract schoolmasters and their scholars, as also all ages and all classes of the public. Re-arrangement and frequent change of exhibits are to be recommended in these museums, whilst they are, as a rule, to be deprecated in most others.

A *School Museum* is a museum of any kind formed in connection with a school. Such collections are usually intended to encourage natural history observation amongst the pupils, and are small and local. Some School Museums are, however, collections formed for the teachers' use in class work. These contain, usually, only type specimens, and but very few of these. They are meritorious and good as far as they go, but it is, but too often, only a very little way. When Educational Museums become common it is to be hoped that they will either greatly strengthen the school collections or render them wholly unnecessary. In an Educational Museum several or many schools might join, and well-skilled teachers might be employed, such as a private school could hardly afford.

A *Folk Museum* is a collection of objects designed to illustrate progress in the arts of social life, more especially those of domestic employment. These are of much interest and always attractive to visitors, and are very useful in stimulating the historic sense. They are perhaps, however, less definitely instructive than some others. We are not acquainted with any special Folk Museum in England, but most of our large museums have sections of this character.

Many other special designations which are given to museums having special objects might be mentioned, but they scarcely need definition. We have museums of Archæology, of Geology, of Natural History, of Geography, &c., &c. These objects are all included in the scope of most Metropolitan, County, General, and Educational Museums.

In many instances at the present time, Museums and Art Galleries are associated. While it is most desirable to encourage the introduction of maps, engravings, drawings and photographs into General Museums when they are illustrative, it may be doubted whether it is desirable to allow works of art and objects of mere beauty to compete in close quarters with those designed for education. In all historical museums, portraits, and even historical art, are, however, not only legitimate but very valuable.

We must end where we began, by a clear avowal of our conviction that the most useful type of museum for the purpose of diffusing knowledge and developing an appetite for study is the Educational one. Unembarrassed by restrictions, it should collect, label, and display anything and everything that can be made attractive and instructive. Such museums ought to be found in every considerable town, and if the State or civic authorities could be induced to devote funds to their promotion, it would be money well spent. We should be very sorry if such institutions were restricted on the "local" (or Toynbee) model.

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ON HOLLOW YEW TREES.

An intelligent Reviewer of our Gazette in the *Morning Post* adverts to our explanation of Hollow Oak trees (that they are caused by lightning), and remarks that it is hardly applicable to hollow Yews. There is no doubt that most very large yews are hollow, and there are but very few records of yews having been struck by lightning. Yews are, however, very peculiar in their mode of growth. The hollows which they enclose are probably not caused in the first instance by decay of central wood, but are to be regarded rather as enclosed cavities. A Yew tree bole, if of large size, has usually been formed by the coalescence, side by side, of several stems. In this process of coalescence there always remains in the middle a vertical chamber which is not obliterated, and in which leaves, water and rubbish may accumulate. Such contents may in the end cause rotting of the bark and wood lining the chimney and thus gradually enlarge it. It is not suggested that this mode of growth is invariable, but it is certainly common, and probably as much so as are hollow yews. In other cases it may be that the breakage of a large bough may admit moisture and thus permit of decay. Our contention is that so long as the bark and outer wood of a hard-wood tree, whether oak or other, remains sound, its middle will not decay.

We have examined a great many Yew trees of various ages. All the old ones are hollow, and all have the central chimney. The opening of the chimney is sometimes small, and in one instance it was so blocked with rubbish that it almost escaped discovery. In all there are appearances suggestive of several stems having coalesced. This tendency, on the part of the Yew, has been noticed by several writers. The separate stems spring from the same stole, they grow straight and so stiff and unyielding that they are forced into side-by-side contact and thus grow into each other. Thus the Yew bole should be regarded as a composite trunk, scarcely ever, much after early youth, consisting of a single

stem. Sometimes, perhaps, an injury to the leading shoot stops its growth, with the result that branches grow up by its sides from near the bottom and enclose it.

A large fungus (*Polyporus sulphureus*) is not unfrequently found growing on old Yews, and it has been accused of attacking the heart wood, but probably it does not gain access until decay has commenced.

We are fortunate in possessing, in the Haslemere Museum, a very interesting specimen in illustration of the suggestion which we now offer. It is a square block, 4 in. by 4 in., of the hardiest red yew wood, which encloses in its middle a stone as big as a hen's egg. The enclosure is complete, but the walls of the cavity in which the stone is embedded show remains of bark and some dried leaves, &c. The stone is immovably fixed. The walls of enclosing wood have very obviously been made up of several stems which have coalesced, for different systems of concentric rings may be clearly traced. The density of the wood at all the exposed parts would imply that the block was cut out of the middle of a tree of considerable size. About this nothing is known. It is obvious that the saw of the woodcutter came upon the stone and that thus its discovery was brought about and the specimen preserved. It was given to Mr. Hutchinson some years ago by the late Dr. M. Baynes.

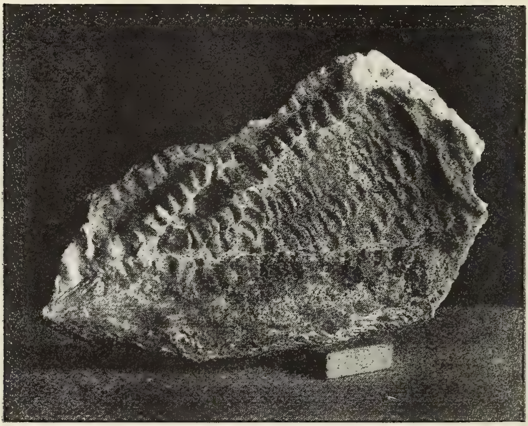
In one of the hedgerows at Inval there is now growing a clump of yew stems enclosing a stone and partially coalesced. Eventually a condition similiar to that in our specimen may be produced, but so slow is the growth of the yew that it may take half a century to accomplish it.

In many instances it is, we believe, the original stem itself which is enclosed, and which, failing to accomplish union with its junior relatives, is killed and undergoes decay. We respectfully offer this to Mr. Chamberlain as a good illustration of the desirability of prompt and complete consolidation of the mother country with her colonies.

ON HORIZONTALLY RIDGED TUFA.

By Dr. G. Abbott.

The specimen shown in the appended illustration is a piece of tufa from the Bath oolite, and is about one-third natural size. It shows very clearly certain horizontal ridges, of which



Tufa showing Horizontal Ridges.

I find it difficult to get any explanation; they are, however, not uncommon, for not only are they to be found on the surface of fissures, as in this case, but also both on stalactites, stalagmites, and on the tufa of sloping surfaces of limestone caves. They are always nearly if not quite horizontal, their two surfaces are frequently unequal, so that a cross section is not unlike the teeth of a coarse saw. Apparently they are not due to any secondary change, like the segregation banding in weathered mortar, but are more probably due to some initial but unrecognised force which may exist in lime. I should be glad to know others' views and see photographs of similar specimens (which would be returned).—G. Abbott, F.G.S., 2, Queen's Road, Tunbridge Wells, Kent.

OAK TREE TRUNKS AND THEIR VESTMENTS.

The trunks of oak trees, as they stand unshaded in the light of a winter's morning, are extremely beautiful. The silvered grey of their stems is set off by the clothing of green velvet which covers their feet and ankles, and if we are favoured with a gleam of February sun the harmonies of sober colouring cannot fail to impress us with delight. We will pause a few minutes to enjoy the general sense of beauty before proceeding to examine in detail the elements which combine to confer it. No two trees are quite alike, although there is a considerable sameness. In some the moss creeps up higher than the foot and gives patches of subdued green high up the bole. Others have but little moss. Some are evenly rounded and free from twigs, whilst others are covered over their whole surface with groups of twigs in patches. Some of them are almost smooth, but in others the cracks in the bark are very deep and wide. Some have much more silver than others, and the manner of its arrangement is also far from being monotonous. Large flat patches of lichen, like outspread hands, or, to be more homely, like cheese plates, interspersed with shaggy tufts of grey slate colour, are the predominent features in some. Others present a more uniform surface as of brightened lead, in which at a distance you hardly detect any special structure. Nor are the warmer colours wholly wanting, for here and there are patches of rich brown, red or yellow, not the less beautiful because they are in most instances the tints, it is to be feared, of death.

Let us observe a little more closely. The warm colours which we have noticed are seen to be usually portions of the fronds of lichen which, as hinted, are dead. The green clothing of the feet is a delicate moss, the threads of which lie smoothly in a dense mat, but all sloping downwards as if they had been carefully combed and brushed by the fairies. This moss is for the most part all of one kind, and it is not now in

"flower" or "fruit." It, however, must not have all the credit of the greenness which we see, for many tracts of bark are simply green over without displaying any visible covering. These are really painted by a minute and microscopic algal, the relation of which to its companion growths is, as we shall see presently, of the utmost interest. The patches which we have irreverently likened to cheese plates are, as all know, lichens, and so also are the shaggy tufts known as "old man's beard." Thus we have mosses, algals, fungi and lichens of various kinds all flourishing on our oak stem and combining to its decoration. If it is asked how it comes that such various guests have succeeded in implanting themselves on the bark of the living tree, the reply must be that the trunk, as a tree, has grown old, so old, indeed, that it has been unable to keep its outermost layers of bark alive. It is their failing vitality which has made them an easy prey to assailants which could have availed nothing against them in their youth. You do not see much moss or lichen on saplings. It might, perhaps, be incorrect to say that any considerable thickness of the outer bark is absolutely dead, but it is going that way. Death may be said to be accomplished when the fluids cease to move, and there is probably exceedingly little movement of the juices in those islands of bark which we see surrounded by deep cracks. We have, however, unconsciously left our attempt at the description of outside beauty and have been drawn into something like speculating on the nature of life. It is time hat we gave place to the botanist with his lens. Indeed, we have, perhaps, kept him waiting too long, and feeling assured that—if we can only persuade him to forego his learned terms—he will add much to the interest of the objects before us, we will now beg him to tell us as much as he can about what grows on the bole of an oak tree.

Possibly several kinds of moss are present at the foot of the tree, but the one which forms such a beautiful smooth green on the bole is the cypress-leaved feather moss.[1] It

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[1] *Hypnum cupressiforme.*

is a very variable species, the source of much perplexity to young moss collectors. Sometimes it is erect, sometimes creeping. The pronounced curling inwards of the terminal leaves is its chief characteristic. When growing on the ground it is often larger. Here is some in "fruit." Take the capsule and detach its lid, probably your pocket lens is not sufficiently powerful to enable you to see the beautiful fringe of teeth guarding the spores within. Put a fruiting piece into your vasculum to examine under the microscope this evening. Excepting on the north side, where patches of more or less clean bark are observable, the whole of the remainder are covered with lichens. As remarked above, being epiphytes, these lichens do no harm to the tree, though it is possible that in rare cases where trees are very thickly matted with lichens growth may be hindered. How did they come? First allow me to direct your attention to a greenish film which occurs near the base of the trunk on one of the exposed patches of bark. Similar films may be seen on old gates, posts and rails after rain. It is the common green algal,[1] a lowly plant, consisting of rounded cells ever growing and ever dividing in moisture. It arose from spores brought in the atmosphere, for there is no spontaneous generation. If the spores of certain lichen-fungi come into contact with some of these algal cells, the latter do not continue to develop as before. The fungus spores germinate upon and surround them, protecting them as it were. Though we have spoken of the fungus element as parasitic upon the algal part of a lichen, yet it is not a true parasite. It does not harm and ultimately kill the algal, but it is only a predominating partner, which demands from the algal the organic food that it requires, and in return supplies the algal with the dissolved salts necessary for its existence. This is one of the most marvellous facts in the plant world. Those without a knowledge of botany still consider lichens, as the old lichenists

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[1] *Protococcus vulgaris.*

did, as forming a natural group of plants. One species of algal may serve as a base for several lichen-fungi. It would appear that, with one exception,[1] as far as is known at present, lichen fungals have become so highly specialised that they cannot leave their host and grow independently; they are like the Amazon ants, which have become so dependent upon their slaves that they cannot exist without them, the slaves making the nest and even feeding the young.

Appreciating them by their superficial characters we may arrange the lichens on the bole into four distinct groups.

Firstly, we have the Leaf-like lichens, which form patches spreading outwards from the centre of attachment in a more or less circular manner. The most noticeable, being by far the largest, forms large yellowish-green patches, the lobed margins of which are smoother than the centres. Its scientific name is *Parmelia caperata*. The smaller patch of a greyish hue without any trace of yellow is the *P. perlata*. It is quite as common as the preceding kind. Here we have a patch of *P. olivacea*, a dark olive-brown insignificant looking plant, always looking as if very tightly pressed or flattened upon the bark. The Parmelias are much used for dyeing.

Secondly, we may note the Beard-like lichens. Look at this one. The branches are of variable length and thickness, the main one being the largest, and all are round. Sometimes it hangs from the trunk, occasionally it grows erect. It is the "beard moss" and "tree moss" of the poets, the *Usnea barbata* of the lichenist. It is very common and widely distributed. In some countries it is used as fodder, and for producing a yellow dye. Another shaggy greenish-white lichen, equally common, has flattened instead of rounded branches, pitted with shallow depressions. It is known to botanists as *Evernia prunastri*. Examine a tuft carefully, you will see it is attached to the bark at one point only. In

[1] The Cora lichen of Brazil has been shown to result from the conjunction of one of the Telephoreæ group of fungi with the cells of a *Chroococcus*.

olden times it was a valued article of food, and is said to be used in Egypt to this day to flavour bread.

In our third group we have species very different from the above. They form well defined dark green or whitish patches 2 to 4 inches across, closely adherent to the bark. The centre of the patch is occupied with wart-like bodies. The commonest is *Pertusaria communis*; under a pocket lens the warts are seen to be pitted with little depressions with dark centres, the whole much resembling a sarsen stone. The grey patch with the very conspicuous little heaps of white powdery stuff upon them are probably only a peculiar form of the *P. communis*. The condition is known as sorediate (see p. 456).

Another common representative of our group is the *Leconora subfusca*. It may be at once recognised by the abundant chestnut-brown circular warts scattered over a sharply defined smooth greyish base. Under a lens each wart is seen to have a greyish-white margin. A lady upon first seeing it under a microscope said it reminded her of a lemon cheese-cake.

In our fourth and last group we have the writing lichens, as we may term them. Their fructifying parts (apothecia) simulate oriental writing. (One of the best known British examples is *Graphis elegans*, common on holly bark). Here is one, a little grey patch with black Hebrew-like characters upon it. If you desire its name it is probably the *Opegrapha vulgata*. Examine some of the "writing" with your lens. An apothecium of this shape is termed lirellate by botanists, a word derived from the Latin "lira," a ridge between two furrows. You may judge for yourself if it is an appropriate one. What may be the age of these lichens we cannot say. How old is the oak? Perhaps it has been growing for more than a century, and the lichens, or some of them, may be almost as old. Berkeley, in his "Introduction to Cryptogamic Botany" writes, "Some of the large patches of Parmelia, which occur on rocks, are of very great age. Patches of such

lichens as *Lecidea geographica* probably date from almost fabulous periods, and even small patches are often of considerable age. I have myself watched individuals for twenty-five years, which are now much in the same condition as they were when they first attracted my notice. Plants which endure without injury such extremes of temperature and conditions of the Hygrometer would seem, *à priori*, to be likely to have great powers of longevity."

NOTES ON MOSSES AND HEPATICS.

(*Kindly contributed by the Rev. E. N. Bloomfield*).

THE months of March and April are among the best for collecting the mosses and hepaticæ, many of which are then in "fruit." The smaller mosses generally "fruit" freely, and it is very interesting to observe the great variations in the peristomes, which, in many cases, are very beautiful; the leaves, also, are well worthy of examination, for they vary greatly, and are interesting objects for the microscope. A good lens will show them fairly well, but a low power of the compound microscope will be found to be preferable. One advantage of thus examining them is that, although the observer may not be able to identify any of the species, yet he will have no difficulty in finding many objects of great interest, even in the commonest, many of which abound on walls, garden paths, banks, trees, &c.

The hepatics are not so easily found, neither do they present so many objects of interest to the general observer. The "fruit" is the same in almost all the species, a succulent stalk bears a globular spore case which bursts and the spores are dispersed. Among the spores are very curious spiral filaments, called elaters, which will interest the observer; they appear to assist in the dissemination of the spores, thus fulfilling the function of the peristome in the mosses.

I will now mention a few of those mosses which may be met with very commonly, and which are well worth careful examination; they do not require any preparatory treatment before being examined.

First the leaves. Most people know the bog mosses, species of *Sphagnum*, which form patches of varying colours, whitish-green or red, in moist woods and bogs; the cells of their leaves contain spiral filaments, and are most beautiful objects for the microscope. The cell structure of many other mosses is well worthy of examination; for instance, there is a moss which is often very common and of good size, covering the ground in many places, *Mnium hornum*, the Swan's neck; the edges of the lanceolate leaves are thickened and denticulate, as are the others of the same genus, but the rest of the leaf, with the exception of the nerve, is only one cell thick. Many other more or less allied genera have the leaf uniform without any thickening of the leaf. *Pterygophyllum* (*Hookeria*) *lucens*, which is very local in the south of England, but not very uncommon on shady banks by streams, is worthy of mention on account of its very large leaf cells, which are clearly distinguishable with a good pocket lens, looking like a piece of fine muslin. *Mnium* and *Bryum*, various species of which are common, afford good examples of wide, often hexagonal, cells, while many of the larger mosses (*Hypnum*, &c.) have the cells long and narrow. In some mosses the cells near the base are very different from those in the rest of the leaf.

The peristomes of the capsules vary very much in form and structure; some have scarcely any visible peristome, while others have a single row of teeth round the mouth of the capsule, and others, again, a double row. The number of these teeth is always a multiple of four: 4, 8, 16, 32, or 64. Of those with single peristome, one which is sure to be met with is *Tortula muralis*, the Wall Screw Moss, which grows very abundantly on walls, stones, bricks, &c.; the capsule is subcylindrical and the red peristome teeth are long and

curiously twisted, hence the name of the genus; the leaves of this species end in fine hair points. Various other *Tortulæ* will be met with, all of which have the peristome twisted in a similar manner. Another very common moss is *Funaria hygrometrica*, so called because its seta, the stalk of the capsule, "turns like a rope from right to left, or left to right, according as it is moistened at the top or bottom." The capsule, also, is very peculiar; it is pyriform, with an oblique mouth, while the peristome is double, closes the opening and lies flat upon it; the stems are short and the leaves ovate and concave; it is often found on spots where wood has been burnt.

The species of *Bryum* have mostly ovate capsules and a double peristome, as has also the genus *Mnium*, one species of which has already been alluded to; the observer will soon meet with many other interesting species.

Nothing has been said thus far about the larger (Pleurocarpous) mosses, some of which are so abundant in our woods and banks, &c.; many of these are rarely found in "fruit," while others "fruit" pretty freely. There are many interesting species among them, but they are not perhaps so interesting to the microscopist as the Acrocarpous species, such as those which are mentioned above.

For those who know very little of these plants I should recommend Stark's "Popular History of British Mosses," which can generally be procured second hand; the plates will be of great use to a beginner as giving a good idea of our moss Flora; there is, however, one disadvantage, that the plates are arranged alphabetically and not in accordance with the arrangement in the text.

For those who know something of the mosses the book to suit them is Dixon and Jamieson's "British Mosses," Second Edition, which is the latest work on the subject, and profusely illustrated.

Thus far I have said almost nothing about the Hepaticæ, but if any one finding a species in fruit will place the spores, elaters with which they are mixed, and the plant

itself under a fairly high power of the microscope, he will find much to interest him. Two species illustrating the very diverse forms and fructification will be found in Stark, Plate XX., the one a *Jungermannia*, foliose with globose capsule, the other frondose, showing the very strange male and female fructification of one of the Marchantiæ. This species, *Marchantia polymorpha*, and *Lunularia cruciata* are not uncommon in waste places, in gardens, on garden pots, and in moist and shady places. They well deserve the name of liverworts; they are dotted with pores of complicated structure, and bear cups containing gemmæ.

EXPLANATORY NOTES ON MOSSES.

The moss class ranks below its richer relations, the ferns, and above its poorer ones, the seaweeds. Mosses have no sap-tubes, and they do not bear true flowers. They reproduce themselves by spores, which are not seeds, inasmuch as they do not follow flowers. These facts are expressed by calling a moss a "cellular cryptogam," but the term "cellular" is not good, because all vegetables are cellular. What it is desired to express is that they have no water-tubes. This want is conveyed in the word non-vascular—that is, without vessels. The word vessels, is, however, not good, since what are meant are pipes or tubes, not "vessels" in the sense in which tea cups and pitchers are "vessels." We will say, then, that a moss is a plant made up of cells only; which has no water-pipes, is without flowers, and produces spores instead of seeds. Inasmuch, however, as mosses produce fruit it is clear that they have structures which take the place of flowers and are to a certain extent like them. These spore-producing structures are objects of great beauty, and it is by their aid,

to a large extent, that the different mosses are classified and named.

The tubes or pipes of which, as we have seen, mosses are destitute, are minute, open channels which, in all the higher vegetables, pass up from root to bud and through which the sap ascends. Their cut ends can easily be seen in the surface of any chip of young wood. The cell structure, which is all that mosses possess, is to be recognised only by the aid of a microscope. The railway foot warmer, if its handles were taken away, or a soda-water flask without its neck, might serve as good representatives of a moss-cell. We have to imagine countless millions of microscopic flasks placed end to end and resting side by side, and we have the structure of a moss leaf. It must be remembered that these cells in the moss are living, and that every one is quietly engaged in its own proper work. Their walls are, however, not absolutely water-tight, and they have plugholes like those of the foot warmer. Fluids are constantly passing from one cell to another, or to the external air. It is thus that the moss makes up for its want of sap-tubes and keeps up a sort of circulation. It will shrivel in hot weather and plump out in wet, and, above all, it can, like other plants, prepare sap and supply it to the buds which are wishful to grow. Here let us note that all mosses are coloured, and that in all, some of their cells possess the green colouring matter called chlorophyl, which has the property of changing, under the influence of light, water and its constituents into a nutritious sap. Mosses are no lovers of sun, but a certain share of it is essential to their enjoyment and their growth. In this they differ greatly from their very distant relations, the fungals, which thrive in darkness. As Mr. Woodhouse liked his gruel "thin, but not too thin," so mosses like to have shade, but not too much of it. They are found flourishing best on the shady sides of trees, rocks or walls, and although some of them love bogs, but few grow in streams or ponds. They are types of moderation and humility, and they are patient opportunists, allowing them-

selves to dry up in hot weather and being ever ready to swell out again when it rains.

It is customary to say that mosses have no roots, but this is almost an abuse of the English language. They have roots which are just as true to their duties as are those of the oak. Those duties, however, do not include the taking up of anything, water or other, from the soil in which they grow, but concern only the purpose of fixation. The proper mode of expression should be that the roots of mosses are, like their stems, destitute of sap-tubes.

The family of mosses is divided into three groups, under the names of Liverworts, Sphagnums and True Mosses. The use of such words as "true" and "false" in reference to natural objects might, perhaps, be suitably discouraged, for they are either meaningless or worse. In the present instance it might be better to speak of Liverwort mosses, Bog-mosses and Urn-mosses.

The following memoranda, which are in part recapitulation of what has been said, may be useful :—

(1) Mosses have no tubular arrangements for the conveyance of sap or water from part to part. Thus they are said to be "non-vascular" plants.

(2) Their roots serve to fix them where they grow, but do not absorb anything from the soil, as do the roots of flowering plants. It is customary, therefore, to say that mosses have no true roots. This is clearly a question of definition of the word.

(3) As mosses are not dependent upon their roots for a supply of food, but derive the latter from the air, their upper parts may continue to live and grow, long after the root and even large portions of the stem, with its leaves, are dead.

(4) The leaves and stems of mosses are of very simple structure, consisting of cells, but little modified, united together. They have no bark or epidermis.

(5) Whilst mosses are incapable of taking up moisture by their roots into the interior of their stems, they have a

remarkable power of carrying it up upon their surfaces, that is, amongst their leaves.

(6) Most mosses love a moist atmosphere, since it is chiefly from the air that they acquire their food.

(7) So efficient is the arrangement on the outsides of the stems of mosses for drawing up water, that if you put a few strands of sphagnum-moss into a tumbler of water, they will act syphon-wise and empty it upon the table.

(8) Many mosses are annuals or even of only a few months' life. Others, however, have an almost unlimited duration of life, their upper parts continuing to grow whilst the lower are dead. The peat underlying a moss-bog is often many feet in thickness.

(9) Although mosses can multiply with extraordinary ease —the least bit of the plant or of its roots being capable of budding and growth—yet they also possess what are equivalent to male and female flowers, the latter of which produce "fruit."

(10) The flowers, both male and female (*Antheridia* and *Pistilidia*) are very inconspicuous and are embedded amongst the leaves. When, however, impregnation has been effected, the female flower develops into a structure which is often of conspicuous size and great beauty of form. This structure, the fruit, was known to older botanists as the "Urn" of the moss, and was said to be placed on a stem. We now speak of a sporangium, or sporogonium or spore-capsule, and say that it is mounted on a seta or bristle.

(11) The male elements in the mosses—the equivalents of pollen grains—are not conveyed by the air, nor by insects, but travel in the water which surrounds the moss-stem. They are known as spermatozoids, and probably possess the power of spontaneous movement.

(12) The spores of mosses if sown on earth germinate and produce a green filamentous structure which spreads over the surface and produces "roots," but for a certain time no leaves. There is no demonstrable embryo, no cotyledons, no

plumule, and no radicle, and it is therefore thought best to deny the term "seed" to these spores, although they are sexually produced.

(13) The name given to the first filamentous growth from moss spores is "protonema." It resembles the mycelium or spawn of a fungus, but unlike it is always green. A yet more close resemblance is perhaps to a conferva (an alga).

(14) After a certain duration in its leafless and stemless form, the protonema develops stems and leaves, and these in turn produce flowers and fruit.

(15) Mosses stand between seaweeds and ferns, but show remarkable differences from both.

(16) The Liverworts are classed with mosses or as very close allies. They are sometimes called "leafless mosses," having instead of leaves a broad flattened stalk. Their urns, or sporangia, open by side valves, and not, as do the mosses, by a mouth at the top of the urn.

(17) The term *Urn* is singularly well adapted as the familiar equivalent for many forms of sporangium. The sporangia of mosses differ in pattern as tea-urns do, and show as many varieties of form; they have mouths like urns and many have lids, many also have in their centres a columella, equivalent to the heater of the urn. Unfortunately tea-urns have so nearly gone out of use that their names will soon convey no clear meaning, and we shall have to fall back on the original but less cheerfully associated utensils of that name.

LABELS FOR COMMON MOSSES.

[*For a Vivarium in March.*]

COMMON HAIR MOSS (*Polytrichum commune*).

Stems long, not branched. Leaves very long and spreading, recurved, and toothed. Sporangium (the urn which contains the spores) four-sided. A very common species in woods and on heaths, especially on wet sandy soils. Bearing fruit in early summer. Forming dense tufts a foot or more across. Used by the Laplanders for "bed and bedding." (For other economic uses see White's "Selborne," Letter XXVI.). (*Polytrichaceæ.*)

SWAN'S-NECK THREAD MOSS (*Mnium hornum*).

Stems elongated. Leaves spear-shaped (lanceolate), with thick edges. Capsule large and drooping, with a hemispherical lid. Fruiting early in spring. A very common and showy species, forming large pale green tufts of foliage in shady moist woods and lanes in hilly districts. (*Bryaceæ.*)

COMMON BOG MOSS (*Sphagnum cymbifolium*).

Stems ranging from 1 to 12 inches in length. Branches in bundles of three, four or five together, some drooping, others spreading. In fruit from June to August. The male flowers may be found in March in the upper branches of the stem. Very common in moorland bogs and damp woods. (*Sphagnaceæ.*)

Bog mosses absorb the rain upon hillsides, and gradually let it down. Their leaves are specially adapted for this purpose, being composed of bag-like cells. There is a hole in each cell which is held open by a spring (spiral) within, allowing the water to pass easily in and out. These spirals can be seen with a good microscope. Bog mosses form peat, and are extensively used by gardeners for packing.

HYGROMETRIC CORD MOSS (*Funaria hygrometrica*).

The fruit-stalks of all members of the genus twist like a piece of cord in dry weather, whence the name, from *funis*, a rope or cord. It is a typical heath moss, occurring more especially on scorched ground, forming beautiful pale green patches. At maturity the capsules are orange-red. Fruiting in spring. Common. (*Funariaceæ.*)

RED-STEMMED FEATHER MOSS (*Hypnum Schreberi*).

Stems rigid, erect, of a beautiful red colour. Leaves crowded, elliptical, concave, terminating in a short point; yellowish-green. Fruit-stalk growing from the side (lateral). The fruit is rare, occurring from November to April. A common species in bushy places, on moors, and in woods. (*Hypnaceæ.*)

GLITTERING FEATHER MOSS (*Hylocomium splendens*).

Stem partly erect, sometimes a foot in length. Leaves faintly two-nerved at the base, those of the stem with a long point, those of the branchlets with a short point. Fruit-stalks generally two or three together, about 1 inch long. The fruit, which occurs in spring, is rarely seen in the southern counties. The moss occurs on the ground, chiefly in woods, and can be known easily by its very glossy stems. (*Hypnaceæ.*)

TRIANGULAR-LEAVED FEATHER MOSS
(*Hylocomium triquetrum*).

Forming tall, stiff, standing tufts, several inches long, of a yellowish-green. Stems nearly simple, seldom branched, ascending, red. Very common in woods and on banks, bearing fruit in early spring. Much used for packing on account of its lightness and elasticity. Often dyed an intense green and used for decorative purposes. (*Hypnaceæ.*)

DROOPING-LEAVED FEATHER MOSS
(*Hylocomium squamosum*).

Stem slender, erect, slightly divided, with a few scattered branchlets. Leaves rough, with projecting or deflexed scales (= squamose); very much pointed (acuminate) and recurved. Forming green soft tufts about 2 inches high, in pastures, woods, heaths, &c. Extremely common. Bearing fruit (but rarely) in winter. (*Hypnaceæ.*)

BUD-HEADED THREAD MOSS (*Aulacomnium androgynum*).

Forming dense cushion-like (pulvinate), bright green tufts on banks, trunks of trees, stones, &c. Bearing fruit (but rarely) in summer. Peculiar in frequently bearing reproductive buds (*gemmæ*) instead of fruit. The gems were formerly mistaken for the male blossoms, whence the specific name. (*Meeseaceæ.*)

TAMARISK-LEAVED FEATHER MOSS
(*Thuidium tamariscinum*).

Growing in loose, deep green tufts, in woods and on banks; common. It fruits in November, but the fruit is very rarely seen. The stem is more or less clothed with numerous branched, thread-like bodies (*villi*). The heart-shaped leaves, toothed on the margin, have minute projections (*papillæ*) on both surfaces. It is often proliferous, *i.e.*, it produces young plants from various parts of its surface; hence the old name *Hypnum proliferum*. (*Hypnaceæ.*)

APPLE MOSS (*Bartramia pomiformis*).

Forming soft, yellowish-green cushions on dry shady banks, and in fissures of rocks on a sandy or granitic soil. Leaves spreading, twisted when dry, strongly serrated, the nerve reaching to the top. Capsules apple-shaped and topped by a slightly curved lid. The fruit ripens in spring. (*Bartramiaceæ.*)

BRISTLE-POINTED HAIR MOSS (*Polytrichum piliferum*). One of the heath mosses, forming loose green tufts on heaths and similar waste ground. Readily known by its large, thick, lance-shaped leaves, sheathing at the base, and terminated by a white, hair-like, toothed point. Capsules large, four-angled. Fringe of sixty-four teeth. The calyptra (hood) is large, covering the whole capsule, and is clothed with a dense felt of shaggy hairs. Common. (*Polytrichaceæ.*)

PURPLE FRUIT HEATH MOSS (*Ceratodon purpureus*). Forming large reddish-purple patches on heathy waysides, the colour arising from the purple fruit and fruit-stalk at maturity. Leaves lance-shaped, with reflexed entire margins keeled on the back. Capsule oval, slightly curved, furrowed when dry. The fringe of sixteen teeth, united by transverse bars, forms a beautiful object for the microscope. Müller says of this species: "It is the greatest cosmopolite of all the mosses, inhabiting every region of the earth, created, as it were, to worry the bryologist." (*Dicranaceæ.*)

CYPRUS-LEAVED FEATHER MOSS (*Hypnum cupresiforme*). Widely distributed, especially abundant on heathy moors, where it forms vivid green patches. The foliage somewhat shining. It is very variable, sometimes prostrate, sometimes erect, but may be easily determined by microscopic examination of the leaves, which are nerveless or very faintly two-nerved, with very narrow elongate leaf-cells. *The cells at the marginal base are always quadrate and opaque.* (*Hypnaceæ.*)

WHITE FORK MOSS (*Leucobryum glaucum*). Very distinctive, growing in dense tufted masses on damp heaths. Tufts white, often large, with the appearance of bog-moss. Stem 2 to 4 inches long. Leaves very spongy and elastic. Fruiting (but rarely) in spring. "The young male plants nestle in a mass of fibres produced from the upper leaves of the abortive female flowers, and are ultimately developed into a little branchlet." (*Dicranaceæ.*)

SEASONAL NOTES.

The following wild flowers—together with the majority of those alluded to in our notes for January and February—may be seen in March: Marsh Marigold, Wood Anemone or Windflower, Sweet Violet, Sloe or Blackthorn, Strawberry-leaved Cinquefoil, Golden Saxifrage, Mezereon (very rare in the wild state), Spurge Laurel, Common Elm, Wych Elm, Yew, Daffodil, Snowdrop, Butcher's Broom, Alder, Aspen, and the various species of willows and poplars.

Now is the time to study catkins. Go to the bank of a pool or stream, and you will find those of the willow and alder in abundance. In the willow the male and female flowers are on separate trees. Such trees are called diœcious by botanists. The male catkins of the willows are the very golden ones; those of the female are silvery green, never golden. The pods are ripe in June; to watch the opening of these is a very instructive lesson.

The alder is monœcious, that is, it has the male catkins and female cones on the same branch. Like the majority of catkins, those of the alder appear before the leaves. They are produced at the extremity of branchlets, the long drooping male catkins on the lower branchlets; the small female flowers (cones) on the upper ones. The male catkins may be two or three inches long; the female cones do not exceed half an inch in length.

In the hazel the male flowers appear in autumn, but remain in an unexpanded state until March (February in very mild seasons), when they open. The golden tassels of the male flowers are very familiar to all, but the little female flowers, with their crimson styles, are frequently overlooked. The difference in the number of seeds produced by catkin-bearing plants is very remarkable. The willow may produce a million seeds on a single spike, the hazel usually not more than four. The former is dispersed by wind, and must be

light; the latter is dispersed by animals, and must be large to attract attention.

March is another poor month for the mycologist, but few species are to be found additional to those we noted in the past two months. On some old birch trunks may be seen old sporophores of the birch polypore (*Polyporus betulinus*). If the season is mild and damp, late in the month or early in April, the very curious fungus, *Sclerotinia tuberosa*, may be found in chestnut and other woods. It is an ascomycete.

In the young state it resembles a small brown cup about half an inch high, and a quarter of an inch in diameter. As it approaches maturity it expands, and ultimately becomes quite flat. It appears closely seated upon the ground, and devoid of stem. If the earth is carefully removed, it will be seen that the little brown cup is seated on the extremity of a flexuous brown stem, about two and a half inches in length, which terminates in an irregularly elliptical, hard, black body, which is white inside. This body is known as a sclerotium. It is a peculiar condition assumed by the mycelium of the fungus whilst in what may be termed a resting stage. The duration of the quiescence is unknown to us. In former days, when the black bodies were improperly understood, they were classed under a genus Sclerotium. The sclerotium of *Sclerotinia tuberosa* is always attached to the rhizome of the wood anemone (*Anemone nemorosa*), upon which plant it is therefore a parasite.

By the time these notes appear in print frog and toad spawn will be abundant in many ponds and ditches. These amphibians show a marked partiality for certain places for spawning. Frog's spawn may commonly be found in the first week of the month; toad's spawn is not often seen till a fortnight later. These spawns may be easily distinguished. That of the frog consists of a glairy mass containing many round black spots; toad's spawn is never in a mass, but is arranged in long double chains.

The following birds nest in March: Raven, Rook, Crow, Hooded Crow, Heron, Crossbill, Long-Eared Owl, Tawny Owl, Song Thrush, Mistletoe Thrush, Blackbird, Robin, Hedge-Sparrow, Long-tailed Titmouse, Woodlark, Kingfisher, Woodcock, Moorhen, Ring dove, Stock dove, and Rock dove.

In this month we may begin to watch for the arrival of the spring migrants. One of the first to arrive is the chiffchaff, usually in the second week. About a fortnight later comes the wryneck or "cuckoo's mate," as it is popularly termed, from its habit of sometimes arriving in this country with the cuckoo. It is essentially a woodland bird; like the woodpecker, it nests in a hole in a tree, but unlike that bird, does not go to the trouble of drilling one.

Its plumage much resembles that of the bark of the trees which it loves to climb and examine for insects. Like the green woodpecker it is very fond of ants, and will frequently visit ant-hills. "The peculiar habit which the bird has of twisting the neck with a slow undulatory movement, like that of a snake, has obtained for it the name of wryneck, not only in England, but throughout the Continent, wherever the bird is known," writes Mr. Harting.

The first "Bee" of the season is usually not a bee at all. You may find him some sunny morning crawling languidly on the windows, and may not improbably exclaim, "Oh, a poor drone!" He increases the deception by twitching his abdomen in the peculiar way that bees do. He looks to the uninstructed exactly like a bee. He is, however, not a bee, but a big fly, quite harmless, and may be handled without fear. He is one of the Drone flies (*Eristalis*) which has been aroused from hibernation by the mild weather.

In summer these flies may be seen commonly in gardens hovering over flowers in the manner of their allies, the Hover-flies. The abdomen of the latter being banded with black and yellow, causes them to resemble wasps. Look carefully at the Drone fly, you will at once distinguish it from a bee by

its smaller antennæ. There are other points of distinction which may be observed. It is said that field spiders are deceived by this fly. When one is caught in a web the spider acts as it does with a humble bee, enveloping it in a web before coming to close quarters to inflict a bite. The larvæ of the Eristalis are known as rat-tailed maggots, being provided with a long tail-like appendage. They may be found in ditches in summer.

For the following notes on Entomology in March we are indebted to Mr. Oldaker, the Hon. Secretary to the Haslemere Natural History Society :—

On any warm and bright day in March we may expect to see several species of butterfly on the wing. Most of these have passed the winter in the imago stage, such as the Brimstone (*Gonepteryx rhamni*), and the two Tortoiseshells (*Vanessa polychloros* and *V. urticæ*). It is well worth while to follow the females and to observe them ovipositing, the first-named on the Buckthorn, and the small Tortoiseshell on the Stinging-nettle, for the eggs of Lepidoptera are very beautiful when seen under the microscope, and the attention of many of our prominent entomologists is being devoted to this subject at the present time.

Any one who breeds Lepidoptera from the egg is often confronted with a difficulty at this time of the year, for the larvæ of many species, whose eggs are deposited in the autumn, have an unfortunate habit of emerging before their food plant is ready, and a diligent search has to be made for a bud or shoot more advanced than the rest. A notable instance is that of the Orange Sallow Moth (*Xanthia citrago*), which feeds on Lime, and when the larvæ come out about the middle of March, the buds of the Lime are in a sticky condition, with no trace of green, except deep inside the heart.

The same difficulty is often experienced with some species which spend the winter in the larval state. They take

advantage of a warm day to come forth, and if they cannot find some food at once, the more delicate ones are apt to die off. The curious larva of the Purple Emperor Butterfly (*Apatura iris*) is a case in point. It passes the winter, when it is about half an inch long, fastened by a silken pad in the fork of its food plant (Sallow), and even if the leaves are well advanced when it begins to move it will not always feed readily. Sometimes it will travel a long distance in search of a leaf to its taste, and finally, refusing to feed, it will shrivel up and die. This may sometimes be due to the presence of an ichneumon larva within, but the parasite generally takes good care to avoid the vital organs of its host, even up to the time of the latter's pupation.

A round of the gas lamps about 11 p.m., especially on a warm damp evening, will be profitable during the latter part of the month. Many of the common Noctuæ will be found, and some geometers, such as the handsome Oak Beauty Moth (*Biston strataria*). The male is much more frequently seen on lamps than the female.

OUR LEXICON PAGE—EXPLANATION OF SCIENTIFIC TERMS.

(*Continued from p.* 404.)

Pleuro (Greek, *pleura*, the side). All words beginning with pleuro are to be understood as referring in some way to the side of the object described. The *pleura* is the lining of the chest cavity. It also invests the lung, and a *pleurisy* or *pleuritis* is an inflammation of this side chamber. If you have a fixed pain in the side of the chest it is a *pleurodynia*. Fish which appear to swim one side uppermost (flat fish) are *Pleuronectidæ;* animals which manage in some fashion to fly by the aid of skin webs extending along their sides (flying lemurs, flying squirrels, &c.) are said to be *pleuroptera*, or side winged,

and a large family of mosses which send their fruit-bearing organs from the sides of their stems instead of from their points are *pleurocarpous*.

Acro (from Greek, a point), when it begins a word, in distinction from *pleuro*, implies that not the side, but the point of the object described is concerned. In mosses we have *acrocarpous*, as denoting those which bear their fruit at the tip of the stem, and not at its sides. Acro, like pleuro, occurs as the first part of many words in use in botany and other branches of natural history, and both should be carefully kept in mind.

Chevron (French for a rafter). To be *chevroned* is to have angles meeting at the top like the rafters in a gabled roof, or like the teeth of a saw. The word is used in reference to ornamental patterns on pottery, to arrangements in architecture, and to certain triangular bones.

Herring-bone pattern is a term applied to lines when arranged like the side bones on the spinal column of a herring.

Incisor means cutting or biting, and is applied to the front teeth.

Canine means dog-teeth or prey-seizing teeth, and is applied to the "eye teeth,"

Molar means grinding, or masticating, and is applied to the back teeth (or "cheek teeth.")

Late Keltic Period.—The five hundred years of British history which preceded the Roman occupation. It was during this period that Cæsar's incursion took place. The period begins with the general use of iron, which was coincident with the arrival of the Brythonic kelts. Thus "Late keltic" is almost equivalent to "Brythonic keltic," and is applicable to the "Early Britons" of druidic times.

The Bronze Age.—The period of time or stage of civilisation during which bronze was the metal chiefly in use. It followed the Stone Age and preceded that in which iron was employed, but it must be understood that it began by degrees

and ended gradually, and was by no means exactly coeval in different countries.

(*To be continued.*)

NOTES AND EXTRACTS.

Note on the Broomrapes.—We are indebted for the following to Mr. B. T. Lowne, of Catford. The development of the Lesser Broomrape (*Orobanche minor*) must be very rapid, as we recently saw a flowering specimen over a foot high, parasitic on a Zonale Pelargonium, commonly called Geranium, the cutting of which was "struck" about six months previously.

The development of these interesting parasites, according to Kerner, takes place in the following way: The seedling Broomrape has no seed leaves, but produces a spiral filament which penetrates into the ground, and if the root tip does not come in contact with a suitable host-plant before the reserve material in the seed is used up, the seedling gradually shrivels and dies. Should the root tip find a host to its liking it not only adheres to it, but swells out and later forms a bud not unlike a Martagon lily bulb, from the centre of which the flower spike springs.

EARLY USE OF IRON IN EGYPT.

In Table Case K in the Third Egyptian Room at the British Museum may be seen a fragment of iron plate, presented by Col. Howard Vyse in 1838. It was found at Gizeh, near the mouth of one of the air passages of the Great Pyramid. The Guide Book says: "There is no doubt that this object is contemporaneous with the building of the pyramid." This implies that Egypt was in the Iron Age nearly 6,000 years ago. The "Great Pyramid" is

that of Kufu, who is supposed to have reigned B.C. 3969-3908. Case J in the Prehistoric Room contains a lump of iron rust (hydrated oxide) found by Professor M. Flinders Petrie with a mirror and copper tools dating from the Sixth Dynasty, 3300-3100 B.C.

These discoveries suggest that iron was known in Egypt as early as bronze or copper. "The word for iron occurs in the Pyramid texts of Unas, and in the paintings of the time of the ancient Empire weapons and tools are painted blue or black, the hues in which this metal is always represented. Iron plays a prominent part in ancient Egyptian myths, the firmament of heaven being described as a rectangular iron plate: and its Egyptian name is *báa en-pet*, "metal of heaven," evidently in allusion to the meteoric form in which it may first have been known. The Chinese, too, are thought to have been acquainted with iron at least as early as 1000 B.C." (see "Guide to the Antiquities of the Bronze Age," p. 2).

REVIEWS.

Natural History of our Shores.

In a former issue we alluded to Miss Newbigin's book on the Seashore, published by Messrs. Swan, Sonnenschein. We have much pleasure in bringing to the notice of our readers another capital book on the same subject by Mr. Joseph Sinel,[1] recently published by the same firm.

The author is an expert in marine zoology, and has presented his readers with a very graphic account of what he

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[1] "An Outline of the Natural History of our Shores," by Joseph Sinel, of the Zoological Station, Jersey, Associate of the Marine Biological Association of Great Britain. With chapters on collecting and preserving marine specimens, methods of microscopic mounting, &c., and on the marine aquarium. Illustrated by 120 photographs from Nature and numerous diagrams. Pp. xvi., 344, 8vo, cloth, 7s. 6d. post free. London: Swan, Sonnenschein and Co., 25, High Street, Bloomsbury.

has actually seen and photographed, and in more than one instance has adduced new facts. We regret that the book contains no reference to the seaweeds and seaside plants, neither is there any account of the birds ; in brief, it deals only with the Invertebrates and Fishes. The large number of original illustrations adds greatly to the value of the volume. We quote at some length the author's description of the metamorphoses of the shore crab ; for the illustrations of the same we are indebted to the courtesy of the publishers.

Development of a Crab.

Alluding to the *Brachyura*, short-tailed or true crabs, he writes : "Before we enter into the consideration of the different species of those that are found on our shores, it will be well to survey their development, and the changes which they undergo before they reach the adult form, changes which may be likened to the 'larva,' 'pupa' and 'imago' stages of insects. We will take the common shore crab for an example. At certain seasons, attached to the swimmerets of the female (the swimmerets are the oarlike appendages on the underside of the abdomen, strongly developed in the prawn, lobster, &c., and aborted or modified in the short-tailed crabs) are a large number of eggs, attached also to each other in little clusters by fine threads, the result of the coagulation of a gummy substance which is extruded with them. Hatching takes place whilst the eggs are attached, and the young crabs, in form quite unlike the parent, roll helplessly on the sea bottom for a little while, but they rapidly gain strength, and after a few tentative efforts, rise and swim nimbly away, with little spasmodic jerks. Little folds of membrane on their back and at their anterior end are pressed from within until they form long spine-like processes, and the young (a *Zoea*, it is called) is of the form shown. It swims nimbly in the sea, usually near the surface, in this form for two or three weeks, feeds greedily, and changes its coat repeatedly.

"Then after a time its spines disappear and it resembles a

A. B. C. D.

DEVELOPMENT OF SHORE CRAB.

(A) Eggs with enclosed larvæ; (B) just hatched Zoea: (C) Zoea two to fifteen days or so; (D) *Megalope* stage.

A, B, and C, about 20 diameters; D, about 10 diameters.

COMMON SHORE CRAB. $\frac{2}{3}$ natural size.

crustacean of the *Macruran* or long-tailed type, such as the lobster, &c., only it is broader in proportion. It has exchanged its swimming feet for claws and walking legs, and is now of the form termed a *Megalope.* But it still swims in the open, only it begins to frequent the bottom a little. Finally it tucks its tail beneath the body and assumes the *Brachyuran* or short-tailed true 'crab' form (see illustration). Its size during these changes ranges from a small 'o' to a capital 'O' in this type."

How a Crab Changes its Shell.

"While encased in its firm shell a crab is not seen to *grow*, the shell is a 'fixed quantity,' but the crab is growing within, in a state of compression, until, by-and-by, the situation becomes awkward and something must be done. The shell opens at the joint between the carapace and the abdomen or 'tail,' and the crab, covered only with a leathery skin, and elastic as a bag of jelly, withdraws from its tight jacket and is about one-third larger than this old garment. It seeks a place of shelter, for it is aware of its vulnerability, and remains there, still *growing*, for a day or two, until the cuticle of its skin shall have secreted lime and become a casing in which its owner can face the dangers of the open world once more. This ecdysis (or change of shell) presents many interesting points. Not only is the external and visible portion—shell of back, tail, legs, antennæ and eyes—cast off, but with this, and all without severance, the internal shelly parts as well. The covering of the gills, the complicated honeycomb-like structure termed the 'endophragmal system,' the lining of the stomach with its internal 'teeth,' and the blade-like processes which act as tendons in each joint—all are cast, and in the same position as they occupied in life. This is a puzzle in animal mechanics too long to explain here, but which a little thought will show is not so very difficult to unravel, bearing in mind, as a clue, that the internal parts are, as it were, *inwards folds* of the outside.

"One more curious feature in ecdysis. If a crab has, some time prior to the process, lost a leg or two, an eye or claw, the emerging form has these in perfection. (This quite independent of the frequent process of the replacement of lost limbs from a bud which appears on the scar.) If a limb gets broken off *just before* the moult I do not know what happens. This I have not seen, and in this book I am nowhere *quoting*, only telling of what I have observed."

The last sentence explains the lucidity of the author's descriptions. He is a true field naturalist, hence is not dogmatic. In more than one page we find him remarking, "I believe, but am not sure."

CORRESPONDENCE.

TO THE EDITOR OF THE "MUSEUM GAZETTE."

DEAR SIR,—In your Editorial Notes in this month's Magazine, you ask for instances of birds storing winter food.

I was formerly puzzled by finding seedlings of the oak springing up on waste grass land at a considerable distance from oak trees. Acorns are not adapted for transport by the wind, how, therefore, had they been conveyed and planted?

Then an ornithological friend informed me that he had once watched rooks through field glasses plucking acorns, which they carried off to a meadow and buried. His idea was that this was done to provide a reserve store of food for hard weather.

Possibly, however, the object of the canny birds was to make the acorns better fitted for food.

Rooks greedily pluck up the sown grains of cereals when the first green blades appear. I have thought this to be because in germination much of the endosperm becomes sugar.

Probably the acorn also makes more acceptable food at the period of germination.

Anyway, acorns buried by rooks, and overlooked, afford the most probable explanation of the appearance of oak-seedlings at a distance from the parent trees.

6, *Rutland Park*, *Catford*, *S.E.*, Yours faithfully,
February 21, 1907. W. H. GRIFFIN,
Hon. Sec. Catford and District Natural History Society.

TO THE EDITOR OF THE "MUSEUM GAZETTE."

DEAR SIR,—I am enclosing a list of some of the objects in your February frontispiece of the MUSEUM GAZETTE, as far as I have been able to identify them.

I have also been studying the skulls, but have not managed to write an account of them.

In the January number you give a list of flowers that may be found in that month. You might be interested in the fact that on January 3, the day after the heavy snows disappeared, I found no less than ten plants fully in flower. They were : red and white dead-nettle, groundsell, common chickweed, shepherd's purse, field speedwell, Buxbaum's speedwell, dandelion, annual meadow-grass, and *Euphorbia peplus*. On January 10 I found the small stinging-nettle (it is generally very early here), and on January 12, the wild beaked parsley. Except for these flowers, most have been very backward this year, including hazel and elder, in this part of Cambridgeshire.

I should be glad if you could recommend to me a cheap book on British Hymenomycetes. I have just commenced studying Fungi in earnest, and have been much stimulated by the MUSEUM GAZETTE.

I may say how much I like the MUSEUM GAZETTE, and I wish it every success.

"*Penwith*," *Hills Road*, *Cambridge*. I am, yours sincerely,
February 25, 1907. W. N. EDWARDS.

[The best books we can recommend are Stevenson's "British Fungi" (2 vols), and Massee's "British Fungus Flora," vols. i., ii., iii. The latter work may be purchased second-hand for twelve shillings, and is certainly the best we have.—ED. GAZETTE.]

Mr. G. H. S.—Thanks for letter. You will, we think, find some useful information as to the relations between atmospheric and terrestrial electricity in former numbers of the GAZETTE. During a thunderstorm all terrestrial objects become more or less charged, and the best conductors most so. You are, of course, quite right in saying that electricity is "not a fluid," but the term is convenient and is not likely to mislead any one. You write that you "believe it has been lately established that beech trees are no more immune from lightning than oaks, but I have, unfortunately, forgotten my authority for this statement." You will find this subject also fully discussed and statistics quoted in an early number of the GAZETTE (see pp. 118 and 119). Their comparative immunity depends in part upon what other more attractive objects stand near them. Oak trees, with dead and wet boughs upon them, probably serve as efficient protectors. Most certainly it is very seldom that a beech is struck in England.

Skull and jaws of Hippopotamus.

THE

MUSEUM GAZETTE.

No. 12. APRIL, 1907. VOL. I.

EDITORIAL NOTES.

EVERY educational museum ought to possess, either in rotation or permanently, the skull of a Hippopotamus. It is a most instructive skull in several quite different directions. In the first place its bones are very large and easily recognised, and in the next they remain separate from each other at a later period of life than in most animals. Thus it is a good skull to serve as a type and with which to compare others. Nor is it an expensive skull, for the animal is of common occurrence throughout almost the whole of Africa, is easily slaughtered, and its huge head and its ivory tusks claim the attention of the hunter and are often sent home. The hippopotamus has its nearest British alliance in the pig, but unlike the latter, it has four toes. It has small crop ears, an enormous face, a thick, oily and hairless skin, and can open a wider mouth than any other living animal. On reliable testimony it is said that it can bite a man in two. It is a vegetable feeder, but does not ruminate, its huge front teeth would be greatly in the way if it did. (See our frontispiece and also p. 570.)

ONE very definite result of our studies of physiognomy and character has been to establish the fact that great attainments are not realised independently of suitable antecedents. This is the great law of heredity, and with it we associate, as a general conclusion, that intellectual and moral greatness

usually find some expression in the features. To this statement the heroine of our last month's frontispiece is no exception.

Recent discoveries in Babylonia and in Krete have afforded a triumphant vindication of the superiority of Museum methods of research. We of course count under that head all seeking for relics of bygone times which can be made to throw light upon their history. The place in which such fragments of the past can be arranged and made instructive is a Museum. Such has been the success which has attended investigations of this order on the sites of the ancient cities of the East, that much that was hardly better than myth has now been placed on a solid foundation, and whole groups of misconceptions have been removed.

The remarks just made have been suggested by the perusal of a little book by Professor Sayce, published by the Religious Tract Society. It has already reached its third edition. As it carries the imprimatur of the Society no one need fear for his orthodoxy in allowing himself to enjoy its pages, and we can heartily recommend it. It is entitled "Monument Facts and Higher Critical Fancies," and it is not the less readable because, as its title suggests, it is enlivened by controversial spirit. With the controversy we are in no wise concerned. Quite apart from it the book conveys in singularly clear language and from the pen of an authority, many most important statements of fact. Dr. Sayce's contention is that the state of culture which had been reached in Babylon was far more advanced than had been supposed by philologists. "Centuries before Abraham was born Egypt and Babylonia were alike full of schools and libraries, of teachers and pupils, of poets and prose writers, and of the literary works which they had composed." The notion of modern critics that the early Israelites could not read or write he refutes, not without scorn, and upon this refutation bases a proposition that there is really nothing improbable in the supposition that Moses was the author of the Pentateuch.

The sudden and apparently spontaneous outburst of genius which occurred in Greece in the 6th, 5th and 4th B.C. centuries, has been more or less a puzzle to those who believe that all that is good comes by inheritance. We are now assured that it need not be so regarded any longer. The discoveries in Krete have established the fact of the splendour of the court and empire of Minos. Professor Sayce assures us that we may feel certain "that the art of classical Greece was no self-evolved thing, but as much a *renaissance* as the European *renaissance* of the fifteenth century."

It is a little startling at the first blush to be told confidently that "the Babylonia of the age of Alexander was a more highly educated country than the England of George III.," and, although some of us may think that this assertion is a little toned down by a subsequent one, "we now know almost as much, in fact, about the Babylonia of the age of Abraham as we do about the Assyria of the age of Isaiah, or about the Greece of the age of Perikles"; such an effect is by no means intended by the Professor.

Referring to the discovery in 1901 of the inscribed marble blocks in the ruins of Susa the Professor says: "When the characters had been copied and read it was found that they embodied a complete code of laws—the earliest code yet discovered, earlier than that of Moses by eight hundred years, and the foundation of the laws promulgated and obeyed throughout Western Asia." Again, "centuries before Moses the law had already been codified, and the Semitic populations had long been familiar with the conception of a code."

These most important items of knowledge, supplanting as they do the conclusions which had been arrived at by the higher criticism, are claimed as the results of archæological work as distinct from philological speculation. "The spade of the excavator has rudely dissipated the dreams of the higher critic." The Professor is too polite to say so, but apparently he believes that "chips from a German workshop" may be consigned to the use which their name suggests without any

great loss. Although, however, he is scornful as to the self-confident claims of German philology, he is appreciative of German spade work. In the latter department England claims only to have taken her share along with French, Germans and Americans.

One of John Hunter's favourite expressions was: "Don't think, try." It may be read to mean, "do not be content to speculate, make a museum," and this is the temper in which Professor Sayce would deal with the past.

We have good reason to believe that our Gazette has had some share in promoting zeal in the formation and development of museums, and that an important future yet lies before it in this direction. That it was not begun with any aim at financial success will have been from the first evident to all who have had experience in such matters. Inasmuch, however, as we openly sell both books and specimens, it may have occurred to some that profits were being made. The proprietor feels that it is only justice to himself to allow it to be known that neither the Gazette nor the Haslemere Museum, which it represents, make any approach to being self-supporting. Every penny resulting from sales goes in gross total to their aid, but a liberal supplement in cash is still required. Those of our friends who wish to assist the Museum movement which we have at heart can best do so by obtaining for us new subscribers to our Gazette.

We earnestly hope that the admission just made will not discourage any one who may be thinking of undertaking an Educational Museum. The Haslemere one was an experiment, and most experiments are more or less costly. When Museums attain the popular appreciation which is their due it will be easy to supply them economically and to place them on a satisfactory footing. What is needed is combination. A central organisation might make the supply and exchange of exhibits as little troublesome as obtaining books from a circulating library. It might also furnish labels and peripatetic curators and lecturers. We hope for progress.

WHERE TO OBSERVE.

Following up the principle which we have advocated that education should be based as much as possible upon familiarity with actual facts, we purpose to compile for the convenience of our readers a sort of guide to places of historical or natural interest which may be visited. It is far too much the custom to consider, respecting most of these, that they have interest only for the antiquarian investigator. Young persons are allowed to grow up in the near neighbourhood of most instructive fragments of the past without having their attention directed to them. They learn by rote from their school books that the Romans once occupied Britain, but are never taken to the remains of the Roman villa which are within a walk. They visit Sunday after Sunday the venerable parish church, but are told nothing as to when it was built or what it reveals concerning the lives and attainments of their own ancestors. They make their frequent railway journeys and enjoy the views and the change of scene, but little or nothing is done to heighten that enjoyment by giving them an insight either as regards the human interest attaching to the places which they pass or the natural causes of the varied phenomena presented by the fields and the hills.

Much excellent information of the kind suggested is to be found in local handbooks and guides, but apart from the fact that these are rarely accessible excepting on the spot, the facts given are usually disjointed in arrangement. A grave defect in such records is that they remain at their best purely local. A host of county and city histories are in our libraries which contain full and accurate statements, and it will be part of our vocation to direct attention to some of these.

In the compilation of such a general index as we contemplate it will obviously be impossible to proceed in other than a method for the most part fragmentary. We shall

collect the materials for a book or gazetteer rather than attempt to present such a work in anything approaching a completed form. As our task proceeds we shall, we hope, receive much assistance from our many readers who may be able to give information as to places which are well known to them.

What we especially ask for are such details as would guide a stranger visiting the locality in finding what he wishes to see. In many of the places which will be mentioned in our list a visitor would probably be disappointed. He might not be able to find the cutting or the gravel bed, or he might find that the ruins had been covered up again or that the field in which they occurred was no longer open to the public. What we should like to offer to our readers would be up-to-date information which would prevent disappointments of this kind and ensure successful visits.

We offer as a first instalment the following lists:—

SYNOPSIS OF THE MORE IMPORTANT PREHISTORIC AND HISTORIC REMAINS IN BRITAIN.

PREHISTORIC.

Approximate Date.	Period.	Examples in Britain.
200,000 to 5000	Eolithic	Rude weapons of flint in the Forest Bed, Norfolk, on the Downs in Kent, &c. Mr. Benjamin Harrison, of Ightham, first drew attention to these "implements," which he found among the plateau gravels at 400 to 700 feet above sea-level. They are still the subject of much discussion. Sir John Evans deprecated the use of the term "eolithic." "We know not where or when the dawn of human civilisation arose, but it was probably long before the date of our earliest river-gravels, and in some part of the world more favoured by climate than Britain. Why, then, should we speak of British implements as Eolithic?"
	River Drift Man (Paleolithic)	Flint implements from gravels at Farnham and elsewhere. Collections of these and the preceding may be seen in most Museums.
	Cave Man	Collections of implements and bones from caverns may be seen in the British Museum, Torquay Museum, &c. In the department of British Antiquities at Bloomsbury may be consulted a map indicating by means of pins the principal bone caves of England.

Approximate Date.	Period.	Examples in Britain.
		The following are noted: Ffynnan Buenos Cave and Pont Newyff, in North Wales; Creswell Crags ("Robin Hood's" Cave), in Yorkshire; King Arthur's Cave, near Whitchurch, Monmouthshire; Tor Bryan Cave, Kent's Cavern and Brixham Cave, in Devonshire; Wookey Hole, near Wells, Somerset; Oyle Cave, Coygan Cave and Long Hole, in South Wales. To this list may be added Kirkdale, Yorkshire; Crawley Rocks and Paviland (Goat's Hole), near Swansea; aud Banwell, Burrington, Sandford Hill, Bleadon and Hutton, all in the Mendips. "It is clear that some of the sites were included in the area covered by glaciers during the great Ice Age. It is obvious, therefore, that man was in occupation either before or after that period, and the oldest deposits sometimes contain quartzite and flint implements of very rude workmanship, suggesting an antiquity even greater than that of the human handiwork discovered in the drip-gravels." ("The Stone Age," pp. 59, 60.)
B.C. 5000 to 1000	Iberian (Neolithic)	Long barrows. Barrow near West Kennet; the chambered barrow at Stoney Littleton, Somerset, and in many other localities. Stone circles at Abury and Stonehenge, in Wilts, and Stanton Drew, in Somerset; Arbor Lowe, Derbyshire; the Three Hurlers in Cornwall, &c. Cromlechs, including Wayland Smith's Cave in Berkshire, and Kit's Coty in Kent; Merivale, Dartmoor; Lanyon Quoit, Trevethy, and many others in Cornwall.
B.C. 1000 to A.D.	Keltic	British Camps at Prestonbury Castle, Dartmouth; Sinodun Hill, Berkshire. Hut village on Hamilton Down, near Dartmouth ("Grimspound"); Urn-field at Aylesford, Kent (objects in British Museum); Crannogs in Lough Gur and Lough Scur, co. Leitrim, from which remarkable stone moulds for casting spearheads have been obtained. From Lake Monalty and Lough-na-Glack, in co. Monaghan, bronze celts and daggers have been recorded. Crannogs are numerous in Scotland and Ireland; much of interest has been obtained from those in the counties of Ayr, Dumfries and Wigtown—the best English example has been excavated at Holderness in Yorkshire. Crannogs are artificial islands made of logs placed transversely, also brushwood, earth and stones. Another type, known as pile-dwellings, also obtains. English examples occur at Barton Mere, near Bury St. Edmunds; Newbury, in Berks; Southwark and London Wall, in the Metropolis, and Godney, near Glastonbury, Somerset. British village at Chysauster, near Penzance; Excavated dwellings, Salisbury; Maiden Camp, near Dorchester, is a very remarkable hill fortress of this period; it occupies more than 100 acres and is of long, irregular form. War-

Approximate Date.	Period.	Examples in Britain.
		ton Crag, overlooking Morecambe Bay, is another example of these hill fortresses; Barrows near Market Weighton and Cowlam, in the East Riding of Yorkshire; they were for the most part inconspicuous, but contained many bronze and iron relics of great interest and value. Urn-field at Haslemere—objects from this cemetery may be seen in the Haslemere Museum; New Grange Cairn, near Drogheda, Ireland; the Brochs, or dry-built, circular towers of Scotland—they are, for the most part, demolished and round grassy mounds denote their sites. Dun Telve Boch still retains walls 30 feet high and 12 to 15 feet thick; it is at Glenelg, Invernesshire. These towers are most numerous in the North of Scotland, more than 80 have been counted in Caithness, 60 in Sutherland, and no less than 145 in Shetland and Orkney. Interments discovered at Harlyn Bay, Cornwall, in 1900, range from Neolithic up to late Keltic times. "In the earlier and lower interments only the simpler forms of flint, slate and shell implements are found; in the upper and latest the discoveries comprised bronze ornaments and Roman pottery." Silbury Hill, near Amesbury, Wilts. This famous hill is 1,150 feet in circumference and 125 feet high; it is non-sepulchral. Neolithic flints may be collected in many places; they are abundant near Haslemere and may be found on Black Down, where there was apparently a factory. Specimens of the pigmy flints may be had in fair abundance.

HISTORIC.

Date.	Period.	Remains in Britain.
B.C. 55 to A.D. 426	Roman	*Camps and Intrenchments* at Castle Acre Castle, near Yarmouth; Godwin Castle, near Painswick, Glos.; Masbury Castle, near Shepton Mallet, Som.; Peterborough Castle, near Newbury; Roundway Castle, near Devizes, &c., &c. *Walls for Territorial Defence* are Hadrian's Walls and the Wall of Antoninus. *Walls for City Defence* at London; Richborough, Kent; Silchester, Berks; Lymne; Cærwent; Burgh Castle, near Yarmouth; Pevensey; Colchester, Essex; Leicester; Castor, Chester, and Wroxeter, Shropshire. *Towers* at Richborough, Burgh Castle, Lymne, Aldborough, York, Pevensey, &c. *Gates* at Lymne, Pevensey, Colchester, the Portway at Lincoln, &c. Various remains at Bath and Silchester; Pharos or lighthouse at Dover Castle; amphitheatre at Dorchester.

Date.	Period.	Remains in Britain.
		Tessellated Pavements at Bignor, near Arundel; Dorchester, Cirencester, Brading, &c. *Villas* at Woodchester, Glos.; Bignor; Brading, I.W.; Bramdean, Hants; Darenth, Kent; Rodmarton, Cirencester, and other places in Gloucestershire, &c., &c. *Towns.*—There were two municipal Roman towns (Municipia), Eboracum (York), and Verulamium, near St. Albans. The following (nine) had the rights of Roman citizens (Colonioe): Aquæ Solis, vel Aquæ Calidoe (Bath), Camboricum (Cambridge), Camulodunum (Colchester), Deva (Chester), Glevum (Gloucester), Isca Silurum (Caerleon), Lindum (Lincoln), Londinium (London), and Rutupiæ (Richborough). Amongst the towns with somewhat modified citizen rights (Latian) we may mention: Durobrivæ (Castor), Luguvallium (Carlisle), Sorbiodunum (Old Sarum), Theodosia (Dumbarton), and Victoria (Dealgin, Ross). Of those towns paying taxes in money instead of produce (stipendaria), the following are very familiar: Dunium (Dorchester), Isca Dumnoniorum (Exeter), Maridunum (Caermarthen), Venta Belgarum (Winchester), and Venta Icenorum (Caistor). Other well-known towns are Anderida (Pevensey), Brigis (Broughton), Calleva (Silchester), Danum (Doncaster), Durovernum (Canterbury), Ischalis (Ilchester), Mancunium (Manchester), Ratoe (Leicester), Regnum (Chichester), Salinæ (Droitwich), Uriconium (Wroxeter), Uxela (Bridgwater), Verteroe (Brough), and Vindomara (Ebchester).
A.D. 426 to 1066	Anglo-Saxon	Amongst the many Churches bearing more or less Saxon work we may mention: Barton, Lincolnshire; Boarhunt (Hants), Bosham (tower), Sussex; Bradford-on-Avon, Wilts; Brixworth; Canterbury; Deerhunt; Dover (in the Castle), Kent; Durham; Monkwearmouth; Ripon Minster (crypt), Yorkshire; Sompting (tower), Sussex; Stoke D'Abernon, Surrey: Wing (nave, chancel, and polygonal apse), Bucks; and Worth, Sussex. Cemeteries have been discovered in or near Abingdon, Colchester, Cirencester, Ipswich (recently, by Miss Layard), Reculver, Dorchester, Warwick (near), Great Driffield, Beverley, &c., &c. Monastic cells at Skellig Michael; Gallarus, near Dingle, co. Kerry, and other places in Ireland.
A.D. 1066 to 1189	Norman (including Early, Later, and Transitional)	Abbeys of Bury St. Edmunds, Malling, Thorney, Reading, Furness (small portions), Kirkstall, Rievaulx, Fountains and Buildwas (Shropshire), &c. Castles at Scarborough, Colchester, Guildford, Rochester, St. Leonards, Malling, Tintagel, Odiham, Newcastle-on-Tyne, Kenilworth, Carisbrooke, Carlisle, Alnwick, &c., &c.

Date.	Period.	Remains in Britain.
	Norman continued	Crypt and transepts at Winchester; Choir at Canterbury; St. Wulferstan's Crypt, Worcester and Gloucester Cathedrals; Gateway Tower at Bury St. Edmunds; The White Tower, London; the Norman House and Priory Mill, Christchurch, Hants; Crypt and North Transept, Tower, Rochester; Hurley Priory, Berks; Durham Cathedral, the Choir, Nave and Aisles; Lindisfarne; St. Sepulchre Church, Cambridge; Earl Barton's Church Tower; the Leaning Tower of Bridgnorth.
		St. Cross Church, Winchester; Roche Abbey Yorkshire; St. Augustine's Priory, Bristol.
		Christ Church Cathedral, Oxford; Iffley Church, near Oxford; Llanercost Priory, Cumberland; Byland Abbey, Yorkshire.
1189 to 1272	Gothic, Early English	Choir and Transepts of Westminster Abbey; Nave and West Front of Wells Cathedral; Bishop's Palace at Wells; St. Joseph's Chapel, Glastonbury; St. Mary's Church in Dover Castle; Romsey Abbey Church, Hants; Salisbury Cathedral; Ripon Minster; Hall of St. Mary's Gild, Lincoln; Lacock Abbey, Wilts; Royal Choir, Lincoln Cathedral; Llanthony Priory, near Abergavenny; Netley Abbey; Caerphilly Castle, near Cardiff; Eastern Part of Chichester Cathedral; Lady Chapel at Winchester; Abbot's Bridge, St. Edmundsbury; West Door of Aberbrothock Abbey Church; Cormac's Chapel, Cashel.
1272 to 1307	Early English, Transition	St. Ethelbert's Gatehouse, Norwich; Sweetheart Abbey, Kirkcudbrightshire; Hall of Bishop's Palace at Wells; Castles of Conway, Caernarvon, and Harlech; Lady Chapel at Chichester Cathedral; Nave of York Cathedral; Great Hall at Penshurst House.
1307 to 1377	Decorated	Bristol Cathedral; West Door of Elgin Cathedral; Battle Abbey; Remains of Bishop's Palace, St. David's; Edington Church, Wilts (Transition); Choir of Selby Abbey, Old Town Hall, Leicester; Great Bookham Church, Surrey; Spire of Salisbury Cathedral; Ruins of Hall, Maryfield, Sussex.
1377 to 1399	Decorated, Transition	New College, Oxford; Gisburne Priory, Yorkshire; Winchester College; Etchingham Church, Sussex; Bodiam Castle, near Robertsbridge, Sussex; Gateway of Thornton Abbey, Lincolnshire; Town Wall, Canterbury; Maidstone Church; Lincluden Abbey, near Dumfries; Nave of Canterbury Cathedral.
1399 to 1485	Perpendicular	Guildhall, London; Manchester Cathedral; Rosslyn Chapel; Eton College; Sherborne Abbey Church, Dorset; Stavordale Priory Church, Somerset; Churches of St. Nicholas and St. Margaret, at King's Lynn, Norfolk; All Souls' College, Oxford; Churches of Lavenham and Long Melford in Suf-

Date.	Period.	Remains in Britain.
		folk ; Spire, &c., of Chichester Cathedral ; Brislington Church and Magdalene College, Oxon. ; Hurstmonceaux Castle, Sussex ; St. Martin's Church, York ; Winchcombe Church ; Charing Church, Kent ; Central Tower and Lady Chapel of Gloucester Cathedral ; Crosby Hall ; Dominican Friary Ruins at Sligo.
1485 to 1547	Tudor	Bath Abbey Church ; Palaces of Richmond and Greenwich ; Henry VII. Chapel at Westminster ; Christchurch Hall, Oxford ; Westenhanger Church, Kent.
1547 to 1625	Elizabethan	Marquis of Salisbury's Mansion at Hatfield ; Holland House, near London ; Camden House ; Bramhall House, Cheshire ; Burleigh House ; Knowle House, Sevenoaks ; Temple Newsom House, near Leeds.
1625	Renaissance	St. Paul's Cathedral ; Churches of St. Bride's, Fleet Street, and St. Mary-le-Bow.

The list given above must be regarded only as a preliminary one and as quite open to liberal emendation. We trust that many of our readers will visit some of the places named during the ensuing summer and send us reports of their observations. We shall probably republish the list in separate segments. We shall be glad to receive not only special descriptions of single places, but brief notes of tours giving information as to what may be conveniently visited in series. The gift or loan of local guide books will also be acceptable.

Double-lilied Arums.—Two specimens of a duplicate white spathe in an arum have been brought to us at the Vivarium. They were exactly alike, and we were told that there were others. In one spathe there was the flower column as usual, but in its duplicate there was none. The spathe in the latter was developed at the end of an ensheathing leaf. It was as large as the other, though not quite so tall. It was of the same ivory-white aspect excepting at its tip, where it was green. This latter feature illustrates in a most instructive manner Goethe's observations as to the development from leaves of the various parts of the floral envelope. It may be especially noted that it was the proximal portion of the duplicate spathe which had assumed the petaloid condition. It was the distal end which was green.

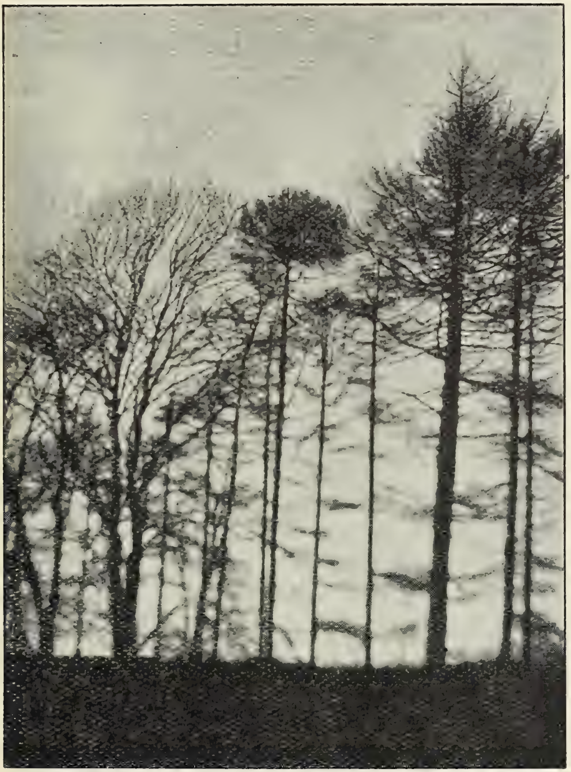
WITCHES' BROOMS ON TREES.

Amongst the objects which the leafless season of the year makes conspicuous in our woods and hedgerows are certain dark, almost globular agglomerations of small twigs on the boughs of many different kinds of trees. They are especially common on the birch, and it is from a birch tree on the Grays

Witches' Brooms on a Birch (from an original photograph).

Wood Road, within half a mile of the Haslemere Museum, that the photograph now reproduced was taken. They look at first sight almost like birds' nests, but apart from the fact that the winter season is inappropriate, it may be observed that they occur on comparatively slender boughs at a great distance from the stem, and that many of them are to some extent pendulous. The conditions are popularly known as witches' besoms or brooms. Their story in its main points may be

easily told, but there will remain a great deal of interesting and important detail to be discussed, and if possible explained. They are usually the results of some bygone disturbance in the economy of a shoot-producing bud, which caused the bud to break up into several instead of continuing its onward



WITCHES' BROOM AT THE TOP OF A CONIFER.
(From an original photograph given by Mr. W. Herridge.)

growth as a single branch. The irritating influence which produced this result was probably applied at a very early period of the bud formation, whilst its development was but little advanced. It may have been of quite temporary duration, but a change in the growth tendencies of the part

having been once affected, there was nothing to bring them again under restraint. Each one of the associated twigs continued to grow and to branch out on its own account. No one could take precedence of the rest, and hence the besom-like formation which we see. We have again a good instance of what Nature affords us so many, the persistence and steady aggravation of consequences long after the originating cause has ceased to exist. That initial cause was in almost all these instances the attack of some parasite. The first effect of the irritation, whether of a living grub, a fungal growth, or the repeated punctures of some insect, was to attract sap and stimulate premature and excessive growth, *Ubi irritatio ibi fluxus*, as the doctors have it. The influence of the first stimulation, might soon come to an end, and then the spoiled branch would be left to develop as best it could. It must be understood that no fresh attacks of the parasite would be necessary, and that possibly neither insect nor fungus would remain permanently in the tuft of twigs. To ascertain and identify the exciting cause, the attacked bud must be examined very early, for subsequently all trace of it may be lost.

Having realised that an early stage is a tuft of small twigs, we have next to note that these may remain separate at their bases or may unite together. Whether the one or the other occurs will depend upon details as to the position and stage of growth of the bud attacked. The difference in result may be that in the one case a hard wood-core will be formed in the middle of the broom which may be absent in the other. Although it is probable that in most instances a bud is the part attacked, the state of our knowledge by no means justifies the conclusion that such outgrowths may not sometimes result from the irritation of young and delicate bark. In such bark there exist many latent embryo buds. It is even possible that in rare instances the irritation may have been from mechanical injury and not from the presence of any parasite. All the more characteristic forms of the "broom" must, however, be re-

ferred to parasites. Inasmuch as they are all growths from the tree, we can easily infer that some trees will produce them more readily than others, and that no two trees will grow them exactly alike. They are very seldom seen on oaks, ashes, chestnuts, and many others, and are rare on the conifers, the

A Single Witches' Broom on an Elm.
(From an original photograph by Mr. W. Herridge.)

blackthorn, the hazel, and a great many others. On birches, beeches, &c., they are common. Some excellent illustrations of the different forms of these brooms are given by Mr. E. T. Connold, in his valuable work on "British Galls." His figures are taken from the hazel and the birch.

Mr. Connold mentions and figures one old birch which had

no fewer than ninety-seven brooms on it. In another instance in which a birch broom had no core, he diligently counted the number of separate twigs springing from the bough and found them more than three hundred and twenty. The twigs which make up a "broom" are of course living, and they bear leaves and shed them just like other parts of the tree. In some instances, indeed, they bear leaves quite as large as the average, but in many the leaves are dwarfed. Brooms do not in any way injure the tree other than that they uselessly consume a certain amount of sap. Whether from insect or fungal irritation they are not infective to the rest of the tree and do not cause decay.

In the above statements we have, we believe, told the truth respecting the origin and growth of witches' brooms, but by no means the whole truth, and throughout we must ask our readers to understand that we are speaking of "brooms" only, using the word in its popular sense, and not as including all consequences of insect or fungal irritation on the stems or branches of trees. The latter are a large group, and many of them never assume any broom-like appearance whatever. It is probable that what we have stated as to the transitory life of the parasitic cause and the persistency of its results is correct, for in large well-grown brooms it is acknowledged to be very difficult to find any trace of parasite. One able observer, Mr. Roger Williams, came to doubt the existence of a parasitic cause at any stage, on the ground of the entire absence of evidence, and it is probable that many others would agree with him. There are cases, however, in which the permanent presence of a fungus living in the woody structure of a broom and producing its fructification every year, has been proved. One such example of what may almost be considered symbiotic growth, was observed in an example of a broom growing on a silver fir, which was finally cut and brought to the Haslemere Museum. Of this a drawing has been preserved. In it the leaves on the branch were all dwarfed. The orange pustules of the fungus were pro-

duced on their under surfaces. We must admit, however, that the damaged branch had by no means developed a well-characterised "broom." The fungus was the *Æcidium elatinum.* What had been caused was a breaking up of the bark at the site of attack, and beyond this the branch was thickened, as is usual when the return of sap is hindered, and the branches were much multiplied, but it could not be said that they grew a good "broom."

It is possible that some of the best "brooms" are caused by the attacks of mites which persist in their occupancy and attack the spring buds every succeeding year.

As we have just remarked, brooms are very seldom seen on oaks. The oak is, however, prone to produce what may be called "witches' scrubbing brushes." In the condition which may be so named, an area, the size, perhaps, of the palm of one's hand, is thickened by a flattened core of wood from which spring innumerable short twigs, but few of them more than an inch or two high. These may be found very frequently on oaks, and if there is one there are usually many on the same tree. We have in the Combeswell Copse (near Haslemere), a small oak, probably thirty years old, on which from thirty to fifty of these brushes may be counted. They begin near the ground and are seen twenty or thirty feet up. The trees near to it are for the most part almost free. This remarkable aptitude of certain trees to produce "brushes" or "brooms" in great abundance, whilst the majority of their neighbours do not grow any, may be allowed to illustrate the fact that the production is far more closely connected with the proclivities of the tree than with the nature of the parasitic injury. Our illustration shows the remarkable abundance of brooms on a birch tree, and plenty of similar instances may be found. Perhaps, however, in copses where birches abound, not one in a thousand grow any brooms. Like the oak many birches produce "scrubbing brushes," but usually these occur only near to the ground.

The attacks of the mite which is supposed to be responsible

for many of the brooms grown on birch and beech, must be of every day occurrence, and presumably are followed only very exceptionally by any growths of a broom character. The mite may be found easily in the leaf buds of these trees.

Witches' Brooms on the Bole of a Beech.
The wearing away of the under part had been caused by cattle.
(From an original photograph given by Mr. Sydney Webb.)

It is necessary only to cut open the bud and use a good lens, when the mites may be seen in hundreds.

It would appear to be unusual for beeches to produce good brooms. Thus they are seldom seen on the branches. It is common, however, to see the bole of the beech low down

surrounded by small twigs which are of the same nature as broom formation, and due, no doubt, to similar causes. A remarkable example of this is shown in our figure, which is reproduced from a photograph given to the Haslemere Museum by Mr. Sydney Webb, of Dover.

In many instances "brooms" produce leaves and even flowers, just like those on normal branches, but in many others the leaves are dwarfed and curled. In the instance of a very large one which grew on a larch and which was cut and brought to the Haslemere Museum two or three years ago, the twigs formed a dense compact mass upon which, wherever there was room, well grown needles were present. There were also both male and female flowers, and near the middle were many old cones which had never been shed. No trace of parasite, either insect or fungus, could be discovered. The broom, which was an enormous one and well characterised, had evidently been of very slow growth.

Several examples of enormous brooms on conifers, especially the Scotch pine, may be seen near Haslemere. In one, in which the tree is near a house, the sparrows have for many years used the broom as a nesting place.

Photographs have been supplied to us showing isolated brooms on an elm, and on a whitethorn tree. On the latter they are exceedingly rare, and have perhaps not been previously recorded.

[We shall in future have more to say on this subject.]

MORE ABOUT HOLLOW TREES.

Are there any old hollow trees in your neighbourhood? If there are they are worth careful inspection. The species of tree should be noted, the size of the hollow, and that of the doorway into it, if there be one, and the trunk outside should be measured. It is but seldom that any important particulars as to the history of such trees are obtainable, but if there are they should be recorded. The process of hollowing is, however, usually a very slow one, and the account of its beginning or early stages is usually far beyond the memory of the oldest inhabitant.

Almost invariably in England an old hollow tree is an oak or a yew, but it may be a chestnut and possibly an ash or elm. On the Continent hollow chestnuts are the most common and also the very largest. We have explained in our last month's Gazette the conditions under which yews become hollow. They are quite different from those of other trees, such as we are now considering.

The conditions which are required in order that a hollow tree may be produced, are that the central wood shall die, whilst the outer part with its bark remains alive. If this has been effected in a young or middle-aged tree, the bark will continue every successive spring to deposit its layer of new wood, and thus the girth of the tree will increase, whilst its interior, now exposed to the air, and perhaps to weather, will slowly crumble away. Thus the outer shell never thickens itself beyond a certain point, whilst the damaged tree may grow in girth and prolong its life indefinitely. It will produce every year new twigs which may form small branches, but never large ones. Thus in its humbled state the quondam giant of the forest lives on, free in its lowliness from risk of further disaster from storms.

The problem in each case is to discover the cause of the death of the heart-wood, for that once effected, all the conse-

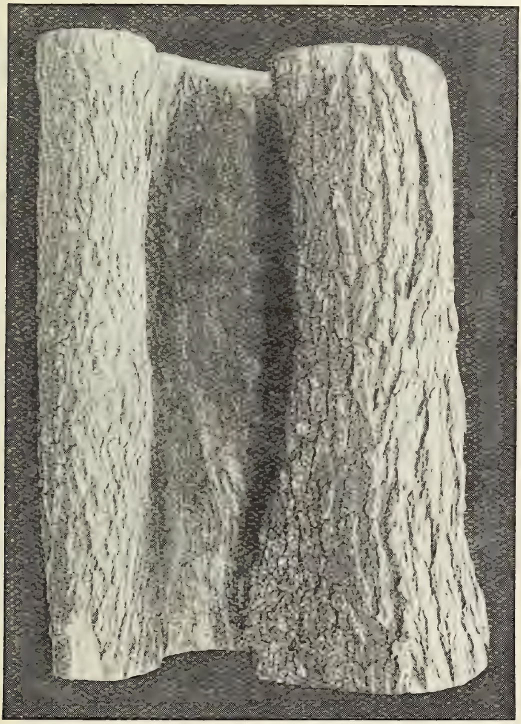
quences are such as might have been expected. We have advanced the opinion that in a great majority of instances, if not in all, the death is caused by electricity. The heart of an oak is very hard, and when protected, may last almost for ever. It has no natural tendency to decay. All decay of wood is consequent on the growth in its substance of fungal parasites, and so long as the bark is whole and the wood living, such parasites cannot easily attack it. Nor does death in itself, if the wood be kept dry, expose it to decay. Witness oak furniture, which, if well waxed to keep the weevils out, will last almost like iron. To explain the decay of the middle of an oak tree, we must presuppose the admission of moisture, and in addition usually some damage to its vitality. A lightning stroke may have split the bole from above, and thus admitted the rain, and at the same time it may have passed down the wood and extinguished what little remainder of life such wood may be supposed to have possessed.

Our next task is to explain the almost invariable presence of a doorway in the hollow tree, by which children, and sometimes others, are accustomed to go in and out. The meaning of this doorway is probably that at the time the tree was struck, a broad vertical strip of bark was torn off, and that part of the trunk killed on its surface as well as its centre. This surface destruction may involve perhaps a sixth or a fourth of the trunk, and if so, the resulting doorway will be correspondingly wide. The aperture can never close, for the edges can never come together. Thus we see that the existence of a doorway is a strong argument in favour of the lightning hypothesis. It is indeed difficult to explain it on any other. Hollow oak trees without side openings are exceedingly rare. Some firs and pines are very prone to rot in the middle whilst the bark remains sound, but this does not often occur in the oak, if ever. When it happens to a conifer it is always due to some damage to the root, which has admitted the fungus which destroys the wood. From such attacks the oak is probably free.

There is now standing at Combeswell, near Haslemere, an oak which was struck some years ago, which illustrates most instructively all that we have advanced. We have already described it at page 205. At the beautiful village of Lynchmere, about three miles from Haslemere, there stands, not far from the Church, a row of most remarkable hollow trees. There are six or seven of them and they stand at considerable distances from each other. Their age is evidently very great, but we are not aware of any facts which may make its estimation possible. Most of them are more than mere stumps and carry branches of considerable size, but all are hollow, and all but one have doorways. In the one in which there is no good side doorway there is an opening low down large enough for boys to crawl in and gain access to the chimney above. In two of these remarkable trees we have the curious phenomenon of a tree growing in a tree. In one instance a birch and in the other an ash has been implanted, probably by birds, in the leaf mould which had gathered in the trunk six or eight feet above the ground, and has there flourished. The trees thus growing have attained considerable size, and the roots of one of them passing down the oak stem have actually reached the ground. The presence of these seems to prove conclusively that at some distant period the oak bole must have been split or a large branch torn off so as to admit rain water and allow of the accumulation of mould. If it be suggested as improbable that several trees in a row should all in turn have been struck by lightning, it may be plausibly replied that the trees are very old and have weathered the storms of several centuries. They stand also on the highest ground in the neighbourhood, whilst the district seems to be peculiarly liable to thunder-storms—possibly because there is much iron sandstone. Probably the trees were struck one after the other at intervals of many years.

The continued growth of a tree-trunk after its middle has been killed and a large side gap made, produces a very curious condition, which has not as yet, we believe, been

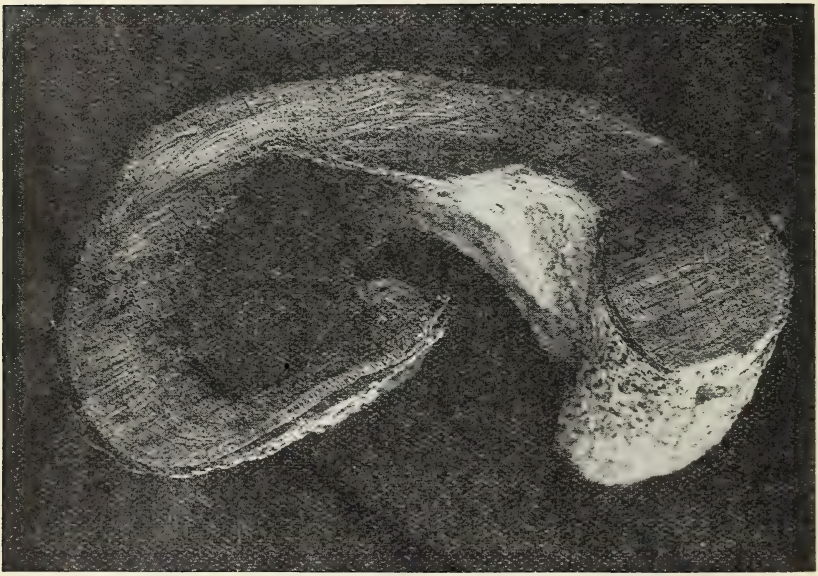
described. The edges of the gap become pushed towards each other, and as they cannot meet they curl inwards upon themselves. The deposit of new wood is least near to the edge, and thus the weakness of the latter favours its curling. What is meant may perhaps be best realised by imagining



Front View of a Portion of a Hollow Elm Trunk, showing the Incurving of the Sides. (From a specimen in the Haslemere Museum, obtained by Mr. Swanton in Somersetshire.) The girth of the specimen was 13 feet 10 inches.

a man's arms extended as if to embrace a large pillar, but whilst enclosing nothing, unable to join hands. The hands would then curve inwards on themselves. The most extraordinary example of this with which we are acquainted may

be inspected any day in the Woods Department of the Museum at Kew Gardens. It was presented recently by Lord Iveagh. We hope to give in a future Gazette a photograph sketch, which will show what is meant. We have in our Haslemere collection a specimen nearly as good, and of this we have given below a photograph. In this instance there is a



A section of the same trunk, showing the incurving of the growth on both sides enclosing the hollow. The lip on the left side is much thinner than that on the right.

history that the tree was struck by lightning many years ago. The same condition in an early stage of its production may be examined in the Combeswell oaks, to which reference has been made above, and also in several of the Lynchmere trees. It may be suspected, however, that oaks do not accomplish this curling in quite so easily as elms, for both Lord Iveagh's specimen of the exaggerated condition and our own are from elms.

MENDEL'S PRINCIPLES OF HEREDITY.

(*Communicated by W. Ruskin Butterfield, Esq., of the Hastings Museum.*)

The researches in plant-hybridisation of Gregor Mendel, an Austrian monk, have conferred greatly increased importance upon the practical study of heredity. Mendel's discoveries were published in 1866 and 1870; but they escaped attention until 1900, when Correns, Tschermak and De Vries independently announced similar conclusions to those arrived at by the previous investigator.

It is well known that certain allied races of cultivated plants and domesticated animals freely interbreed, and that their offspring are mutually fertile. Now, if a plant or an animal bearing a certain character be mated with another plant or animal bearing a different character, it is sometimes found that all the offspring exhibit one character to the exclusion of the other. For instance, if a long-haired rabbit or guinea-pig be crossed with a short-haired individual the litters are always short-haired;[1] similarly, if peas bearing violet flowers be crossed with peas bearing white flowers, the resulting plants will bear violet flowers only. Mendel called the character that appears a *dominant* character and the one that is obscured a *recessive* character.

But characters are not necessarily dominant or recessive. In some cases one character is intensified; thus, when a variety of beans producing brown seeds is crossed with a second variety producing white seeds, the hybrids produce seeds a deeper brown than those of the brown-seeded parent. Again, the offspring of buff pigeons by white pigeons are slate-coloured, like the rock-dove, thus differing from both parents.

Reverting to the hybrids in the first case mentioned—

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[1] We have reason to believe that these results are not uniform.—Ed.

namely, the short-haired offspring of long-haired and short-haired parents—it will be found (1) that if a number of short-haired hybrids are bred with pure long-haired individuals the litters will have on an average equal numbers of long-haired and short-haired individuals; (2) that if the short-haired hybrids interbreed the offspring will consist of three quarters short-haired and one quarter long-haired individuals; and (3) that if the short-haired hybrids are mated with pure short-haired individuals all the offspring will be short-haired.

Mendel explained these results by his theory of the *purity of the germ cells.* He maintained that the hybrids give off two kinds of germ-cells (gametes), one kind bearing the character of one parent and the other kind bearing the character of the second parent; that the two kinds are given off in equal numbers; and that no germ cells are produced bearing both characters.

Putting L for a long-haired gamete and S for a short-haired gamete the results may be illustrated thus :—

Case 1.

Pure long-haired rabbits produce gametes ... L L
Hybrid short-haired rabbits produce gametes L S

Hence the possible combinations are L L, L S, L L, L S; in other words, long-haired and short-haired offspring are produced in equal numbers.

Case 2.

Hybrid short-haired rabbits produce gametes... L S
" " " " " ... L S

The possible combinations are L L, L S, L S, S S, and since L is a recessive character we get three short-haired to one long-haired offspring.

Case 3.

Pure short-haired rabbits produce gametes ... S S
Hybrid " " " " ... L S

The combinations are S L, S S, S L, S S, and as L is a recessive character, all the offspring have short hair.

It will be of interest to compare how the Mendelian expectations agree with the results of actual experiments. The following tables are taken from Mr. C. C. Hurst's "Experimental Studies on Heredity in Rabbits" (*Journ. Linn. Soc. Zool.*, xxix., pp. 283-324).

Table 1.

Giving the results of separate litters produced by crossing hybrid short-haired rabbits with pure long-haired Angoras. H = hybrid; A = Angora. The numbers after the letters identify the rabbits used in the experiments. The doe is placed first in each case.

	Short	Angora
H5 × A2 produced	3	2
H5 × A2 ,, ...	5	2
H7 × A2 ,, ...	4	3
H8 × A2 ,, ...	0	5
H8 × A2 ,, ...	3	3
A3 × H10 ,, ...	3	3
A3 × H12 ,, ...	2	0
Total ...	20	18

The Mendelian expectation is 19 shorts and 19 Angoras.

Table 2.

Giving particulars of crossing hybrids bred from pure Angoras and pure short-haired rabbits.

	Short	Angora
H5 × H12 produced	5	2
H5 × H10 ,, ...	1	1
H7 × H10 ,, ...	2	1
H7 × H10 ,, ...	2	1
H7 × H10 ,, ...	4	1
H8 × H10 ,, ...	1	1
H8 × H10 ,, ...	1	1
H9 × H10 ,, ...	7	1
H9 × H10 ,, ...	5	2
H9 × H10 ,, ...	2	1
H9 × H10 ,, ...	4	0
H9 × H10 ,, ...	6	1
H11 × H12 ,, ...	5	2
H11 × H12 ,, ...	6	2
H12 × H10 ,, ...	2	0
Total ...	53	17

For 68 young the Mendelian expectation is 51 S and 17 A.

It will be seen that while the separate litters do not, as a rule, agree with the Mendelian expectation, the totals exhibit a close agreement; the reason is obvious.

	(1)	(2)	(3)	(4)	(5)	(6)
An Angora gives off germ-cells	A,	A,	A,	A,	A,	A
A hybrid ,, ,,	A,	S,	A,	S,	A,	S

Should mating occur between the two with a litter of (say) four, the Mendelian expectation will be realised if the germ-cells in columns 1 to 4 meet; but each germ-cell in the top row has an equal chance of meeting *any* of those in the bottom row, so that we might have, among other results, the germ-cells in columns 1, 3, 5 and 6 meeting, when the litter would consist of 3 Angoras and 1 short.

Coloboma in the Petals of Narcissus.—Specimens have been brought to the Haslemere Museum in which malformed flowers of the Stella narcissus show a cleft in the lower part of both corolla and calyx. It is as if a fourth part had been cut out. The edges of the cleft are well rounded. The coloboma extends to the receptacle but does not involve the ovary. There are six stamens, but in one case two on the left side of the cleft are united through the whole length of their filaments. The ovary in this instance had three cells, and was in all respects symmetrical. The outer part of the corolla (calyx) has four sepals instead of five. The condition exactly resembled that which is sometimes seen in the iris of the human eye, and is known as "coloboma." In the eye it is usually directly downwards and results from defective closure of the fissure which is present at an early stage in the formation of the organ.

Three flowers growing from the same clump of roots show the malformation and are exactly alike, excepting that in two the coloboma is not directly downwards but slightly to one side. A fourth flower in the same clump is perfect.

NOTES AND EXTRACTS.

We take the following circumstantial description of a globular meteor or "fire-ball" from Flammarian's "Thunder and Lightning":—

In the month of June, 1841, I was staying at the Hotel de l'Agnells in a room on the second floor, overlooking the Corso dei Servi. It was about six in the afternoon. The rain was coming down in torrents, and the darkest rooms were lit up by the lightning-flashes better than our rooms generally are by gas. Thunder broke out every now and then with appalling violence. The windows of the houses were closed, and the streets were deserted, for, as I have said, there was a steady downpour, and the main road was turned into a torrent. I was sitting quietly smoking and looking out at the rain, which an occasional ray of sunlight set flashing like threads of gold, when I suddenly heard voices in the street calling out "*Guarda, guarda!*" (Look, look!) and at the same moment a clatter of hobnailed boots. I ran to the window, and looking to the right, in the direction of the clamour, I saw a fire-ball making its way down the middle of the road on a level with my window, in a noticeably oblique direction, not horizontally. Eight or ten persons continuing to call out "*Guarda, guarda!*" kept pace with it, walking down the street, stepping out quickly. The meteor passed my window, and I had to turn to the left to see what would be the end of its caprice. After a moment, fearing to lose sight of it behind some houses which jutted out beyond my hotel, I went quickly downstairs and into the street, and was in time to see it again and to join those who were following its course. It was still going slowly, but it was now higher up and was still ascending, so much so, that after a few minutes it hit the cross upon the clock tower of the Chiesa die Servi, and disappeared. Its disappearance was accompanied by a dull report like that of a big cannon twenty miles away when the wind carries the sound. To give an idea of the size and colour of this globe of fire, I can only compare it to the appearance of the moon as one may see it sometimes rising above the Alps on a clear night in winter, and as I myself have seen it at Innsprück—that is to say, of a reddish-yellow, with patches on it almost of red. The difference was that you could not see the contours of the meteor distinctly as you could the moon, and that it seemed to be enveloped in a luminous atmosphere of indefinite extent.

The Lama in the New World represents the camel of the Old (*Lama nuanacos* and *Lama vicugna*).

The lama, with its near relatives, the Vicuna and Alpacca, are in many respects like camels. They differ in not possessing humps and in having the pad of the foot more divided, whilst the toes are furnished with strong claws. These peculiarities adapt them for the rocky districts which they inhabit. They have also much thicker fleeces than camels have and are thus adapted to cold mountainous regions. Like camels, they can endure hunger and thirst, and perform long journeys bearing heavy burdens. The moral nature of the two is also very similar; they are both tractable to a certain extent, but bad-tempered and exceedingly obstinate. Both have the disgusting habit of spitting from the nose at those who annoy or oppress them.

The tomb and mummy of Queen Teie, the mother of Amen-hotep IV. (Eighteenth Dynasty, fourteenth century B.C.) has been recently discovered at Thebes by Mr. Theodore M. Davis. From the description of the *Times* correspondent we read "there was no sarcophagus, but a huge catafalque had been erected over the mummy of the Queen. Inside and outside alike it was thickly plated with gold and engraved with the names and titles of Teie and her son, as well as with representations of their adoration of the solar disc." The coffin "is a superb example of the jeweller's work. The wood of which it was composed is entirely covered with a frame of gold inlaid with lapis lazuli, cornelian and green glass. The mummy itself was wrapped from head to foot in sheets of gold. We have the head of the heretic Queen herself in Egyptian alabaster, and with the eyebrows and eyeballs represented by inlays of lapis lazuli and obsidian. The face is evidently a portrait, and a very beautiful portrait it is. It is that of a woman at once masterful and engaging, but apart from the lips there is little that is Egyptian about it, and the delicate sub-aquiline curve of the nose is European rather than African.

Wall paintings by Palæolithic Man have been recently studied by M. Emile Cartailhac and the Abbé H. Breuil in a cavern at Altamira, in Spain. "The cavern is a series of large chambers connected by passage ways. There is no evidence of its having been occupied by either man or beast since the close of the Quaternary, at which time the entrance was completely closed by a fall of earth and stones." Before primitive man used it as an art gallery it had been in the possession of cave bears. The frescoes cover the walls of every part of the cave; unknown signs, as well as animals, are represented, and all do not belong to a single epoch. They exhibit great variety of technique. There are line engravings more or less deeply incised, but the majority of the figures are represented in colour, either red or black, and, for the most part, in a single colour.

A cuckoo was brought to the Haslemere Museum on May 3, which had met its death by flying against a telegraph wire. There was a deep cut immediately below the sternum.

The nest of a long-tailed titmouse containing eight eggs was found near Killinghurst on May 3, 1906.

Dr. Moore Russell Fletcher, in his treatise on "Suspended Animation" (Boston, 1890), pp. 7, 8, observes: "The common pond trout, when thrown into snow, will soon freeze, remain so for days, and when put into cold water to remove the frost becomes as lively as ever."

"When residing in New Brunswick, in 1842, we went to a lake to secure some trout, which were frozen in the snow and kept for use. While there, we saw men with long wooden tongs catching frost fish from the salt water at the entrance of a brook. The fish were thrown upon the ice in great quantities. We had a barrel of them put up with snow and kept frozen, and in a cool place. For six or seven weeks

they were taken out and used as wanted, and might be kept frozen for an indefinite time, and be alive when thawed in cold water. The two pieces of a fish, cut in two when frozen, would move and try to swim when thawed in cold water."

Air may be saturated with water-vapour and yet remain clear if the air is perfectly dust free, for water-vapour requires some nucleus on which to condense as a drop. If by any means air thus saturated be rendered conductive to electricity immediately a cloud is formed. "There is always and everywhere a difference of electric potential between the air and the earth, which increases with the height. The earth is usually negative and the air positive, but there are local and temporary exceptions to this rule when the condition of these is reversed; for instance, during cloudy weather and rain."

Late one summer evening two windows which opened outwards and were wide open became covered with moisture on one side. The panes of those which were shut remained quite dry on both surfaces. What was the cause of the difference?

The growths to which we have ventured to give the vernacular designation of "Witches' Scrubbing Brush" (see p. 528) may be found on oak trees everywhere. We possess a certain amount of evidence in support of the belief that they are caused by gall insects, and would invite the co-operation of our readers in determining the point during the ensuing spring months. They should be watched from week to week. The flies which are suspected are *Aphilotrix radicis* and *Trigonaspis crustalis*, and may be expected to make their attacks in April.

(*Continued on p.* 567.)

IDENTIFICATION OF LAST MONTH'S FRONTISPIECE.

The portrait which constituted our Frontispiece last month is that of an attractive woman. The features are well formed and symmetrical, and the expression that of decision and calmness. Avoiding generalities, it may be said that the chin is of good size, so also the nose; the forehead, both in height and breadth, above the average. The face is oval, and presents no peculiarity. The verdict of all who have expressed opinions to us is that the face is very pleasing, whilst several have called it beautiful. It is that of a lady who travelled in France in the end of the eighteenth century, when it was needful to record on the passport such a description as might serve for purposes of recognition. The terms which were then used: Agée de 24 ans, taille de 5 pièds 1 pouce, cheveux et sourcils châtains, yeux gris, front élevé, nez long, bouche moyenne menton rond fouchu, visage ovale."

There is nothing in the face to reveal racial descent, or to indicate any special peculiarity in character. When we have said that it is that of an intelligent, pleasing, self-reliant woman, we have pretty much all that can be said.

The woman represented was of Norman race, of good, almost noble, birth. She was a descendant of the poet Corneille, a man of strong and independent character. She had been well educated in a convent, but was deeply read in the works of the French philosophers, Voltaire and the Abbé Raynal. Plutarch's Lives had been one of her favourite authors, and from that and other works she had probably imbibed a high ideal of pre-Christian or pagan virtue. There is little more to be said as to the influences which had formed her character.

The portrait is that of Charlotte Corday, the assassin of Marat. It is not proposed in our pages to write history, or even biography, but solely to endeavour to trace character

in features, and to study in character the laws of descent. In this instance we are presented with no unusual difficulties, and as the life of the heroine is well known, it is not needful to enter upon it in any detail. Although the act which has made her name famous was a mistake as well as a crime, there can be no question that its design and perpetration disclosed courage, coolness, and contempt of danger in a very remarkable degree. The white heat of the times in which she lived may be allowed to supply the initiatory impulse, but the resolution which made that impulse capable of realisation, and which left the actor cool and undaunted after its execution, was due to inborn character. Nor is there anything incongruous with such character in the features or in the known facts as to racial and family descent. The portrait which we have copied is one preserved in Paris, and was taken whilst its subject was in prison, a day or two before her death. It is said that she was pleased to have it done, and that it was, indeed, at her own request. She sat for it to the artist Hauer with cheerful calmness. At her trial she had rejected all suggestions of excuse or palliation: "It is I that killed Marat." "By whose instigation?" "By no one's." "What tempted you then?" "His crimes. I killed one man," added she, raising her voice high, "I killed one man to save a hundred thousand; a villain to save innocents; a savage wild beast, to give repose to my country. I was a republican before the Revolution; I never wanted energy." To the last she displayed neither the love of display nor the slightest trace of cowardice. From her prison cell, after having declined the services of a priest, she wrote to her political friends a letter stating that she anticipated happiness with Brutus in the Elysian fields, and in the same packet a letter to her father couched in simple, loving terms.

THE ORIGIN OF GENIUS.

The word genius must be accepted as implying simply the recognition of consummate ability. It is not to be thought of as a faculty in itself, implanted in the organism and distinct from it. It is the result of organisations more nearly approaching perfection than those of other men. It has its degrees, and it may be either general or restricted to developments in one or more directions. However much its source may appear, in some instances, to be inexplicable, it is never really so, and the appearance results only from our ignorance of the facts, or our carelessness in their investigation. Like all other endowments, it results from inheritance. The fact which is so often forgotten in endeavouring to interpret these laws in individual instances, is that every individual inherits his qualities from two parents, and that it is upon the way in which the endowments of these two are fused in the offspring that the result depends. It is necessary also to remember that the qualities which constitute character are indestructible, and that although they may be non-apparent, or almost so, in one generation, they may reappear in another. The newly discovered facts now recognised under what is called Mendel's law may, when further studied, give us much help in this matter.

Developments of character become, as is well known, possessions of the race; and thus we expect to find certain forms of ability manifesting themselves frequently in certain races, whilst relatively absent in others. Another law may also here be hinted at; it is that the older any race has become in its culture, the more likely it is to develop ability and to transmit it. Each successive generation gains from its predecessor, and the brain receives modifications which are absolutely permanent. Thus, we do not expect anything of the nature of genius suddenly to manifest itself amongst the Eskimo, whilst we are quite prepared for it in Greece and Italy. Let

us think for a moment of what the possibilities are in modern society under the influence of the laws of heredity, which have been referred to. The Hebrew nation, old as the Chaldees in its sublime intellectual endowments, has, in modern times, become scattered over the face of the globe. In former days the Roman arms carried the Italian race into regions very distant from Italy; and, as has been often remarked, the conquest of Byzantium by the Turks was the means of dispersing Grecian literature far and wide. Let it not be supposed that these teachers of Greek exerted no other influence than that of schoolmasters on the communities into which they were introduced. Many of them doubtless married and had families, and thus it might happen that the Grecian intellect might become the subject of hereditary transmission and make its appearance where it had not been expected. Owing to the exclusiveness of their religious creed, it may, at first sight, be thought that the Hebrew race had not effected any intermixture with those amongst whom its representatives dwelt. This, however, is probably far from being true, for, during the ages of persecution of the Jews, it was frequently deemed a meritorious work to rescue the children of parents who had been massacred and bring them up as Christians. The children thus saved received Christian names and were ultimately merged in Christian communities. Thus, it has become possible that in almost all large European cities there may be, unsuspected, a certain infusion of Hebrew blood; just as in our island, the Roman occupation of nearly four hundred years is quite sure to have left a certain strain of that of the Italian race. It becomes not at all an improbable suggestion that a very large proportion of the men of remarkable ability who have from time to time made their appearance in Western Europe have been remotely of mixed descent, such as is suggested. It is quite clear that before we say anything as to the inexplicability of manifestations of genius, enquiries in these directions should be exhaustive.

SLOW INFANTILE DEVELOPMENT SUDDENLY FOLLOWED BY PRECOCITY.

The Rev. Robert Hall's biography affords some very remarkable facts in reference to infantile development and precocity. He was the youngest of fourteen children and his parents must have therefore been in middle age. In early infancy he was very backward. His father was a Baptist minister. He did not walk until two years old, nor had he then acquired the faculty of articulate speech. His expression and gestures, however, indicated quick intelligence. It is said that he even learned to read before he could speak. His nurse had taught him his letters and the construction of words from the inscriptions on tombstones, in a churchyard which adjoined his father's house. His interest in these exercises finally loosened his tongue, and his progress was so rapid that before he was three he spoke fluently. As a mere child he engaged in hard study, was fond of metaphysics, and before the age of nine had read and re-read "Edwards' Treatise on the Will" and "Butler's Analogy." At eleven he was encouraged to give addresses at prayer meetings. Subsequently, at the University of Aberdeen, he was without a rival of his own standing, and distinguished himself alike in classics, philosophy and mathematics.

The following brief statements as to Hall's subsequent development may not be without their interest. He was an intimate friend of John Foster, whose character we have considered in reference to his physiognomy at p. 263. Hall's heavy face is well known.

Robert Hall was born 1764 and died 1831. He was a year older than his fellow student and attached friend, Sir James Mackintosh, and six years older than John Foster.

Mr. Henderson states that he was so far a materialist as to hold that man's thinking powers and faculties are the result of

a certain organisation of matter, and that after death he ceases to be conscious till the resurrection. When 44 he married. In the latter half of life he smoked excessively.

He was of powerful and athletic build, with great breadth of chest. According to Foster his countenance "was formed for the most declared manifestation of power." Henderson writes, "the forehead was high and sloping, with well arched brows, beneath which his dark and brilliant eyes in his more excited moments burned and glowed with thought and passion. The lower part of his countenance indicated a vehement and headstrong temperament under the control of an iron will—doubtless powerfully reinforced by the strong moral sensibility which gave a peculiar elevation and dignity to features *possessing no trace of grace or beauty*." Foster referred to his "stern, intense, somewhat formidable expression."

GOETHE ON DANTE'S BUST.

"Now," said Goethe, pointing to the bust, "Who is this?"

"Apparently, a poet, and an Italian," I replied.

"It is Dante," said he; "it is well done; a fine head, yet not very pleasing. He seems old, bowed down, and peevish; the features are lax and drawn down, as if he had just come from hell. I have a medal, which was struck during his life, and there everything appears much better."

He rose and brought the medal. "Do you see what power there is in the nose and the swell of the upper lip, the energy of the chin, and its fine blending with the cheek bone? The part about the eyes and the forehead are the same in this bust, but all the rest is weaker and older. Yet I will not find fault with the new work, which, on the whole, has great merit."

OBSERVATIONS MADE IN THE GARDENS OF LONDON SQUARES.

There is only one tree in the garden of Cavendish Square which shows anything like a witch's broom, and it is, perhaps, only a pigeon's nest. There are several, however, which exhibit the "witch's scrubbing brush" in profusion. A lime tree (the tree nearest to Harley Street) shows them best. From the ground upwards are seen a number of flattish bosses from which twigs grow. The twigs in this instance are much longer than those seen in oaks, and thus destroy to some extent the likeness to a brush. The growths are, however, of the same nature as in the oak. They result from the irritation caused by the deposit of the eggs of some insect, by which bark-buds, otherwise dormant, have been stimulated to growth. This same tree was last summer much infested with aphis, its leaves being covered with honey-dew.

A huge growth, probably caused by some irritation of like kind (but not growing twigs or making any sort of broom or brush) may be seen high up on one of the largest Plane trees. If the observer will seek a garden-seat under the tree nearest to Scott's bank and look up into the tree in front of him towards the north, he can scarcely miss it. It is a big, bossy mass, a yard across and probably more than a foot thick. Is it a cancer? we shall be asked. The answer must be that it is a tumour, and perhaps as near "a cancer" as a tree can grow one. It differs, however, from all cancers in animals in that it will do no harm to the tree which has grown it. Such tumours are instructive examples of the long persistence of results after the removal of the cause which set them going. The cause was probably the irritation of an insect many years ago, and the insect probably ended its local existence soon after the growth started. The tree, however, had no power to control a process which it had commenced, and went on year after year adding to growth which was of no sort of use either

to itself or to the minute attacking insect. Such growths are exceedingly common on trees, and may be seen low on the boles of many Planes. They are sometimes of enormous size, as, for instance, on those in Berkeley Square. It is seldom, however, that so fine a specimen as this one can be found.

Before leaving his seat the observer will do well to look at the hanging seed vessels on the Plane, and to notice that they are very abundant on some boughs and almost absent on many. This proves that there is a certain amount of individuality, not only in different trees of the same species, but in different branches of the same tree. The botanist recognises this fact under the name of bud-variation, and well knows that every bud has its own personality, which it does not wholly share with the parent tree. In this instance a bough which hangs to the south, and is against the sky when the eye is directed to the builder's tall crane now in position, is festooned with long pendant seed vessels, and there are scarcely any on other parts. The same tendency may be observed on other trees: in some only certain small branches or twigs have seeds, whilst in others they are sparingly scattered over the whole tree.

On rising from the seat where he has been placed, the observer should look into the tree which he has been sitting under. He will see a very noteworthy example of the ability which most trees have to permit their branches to grow back again into the parent stock or to unite with some adjacent branch. A bough as thick as a child's thigh passes upwards quite separately for about eighteen inches, then inclines towards the trunk, joins it, and is absolutely lost. An open space is thus enclosed through which a small baby might be squeezed. This estimate of size is suggested by the fact that in the days of superstition such clefts were valued for that purpose and were esteemed useful for the cure of certain infantile ailments. In this instance no ridge is seen to indicate that the bole above has received any additions from the coalesced branch which has joined it. The condition is suggestive of the rounded

handle of an old-fashioned Toby jug. It is very difficult to suggest any explanation as to what caused the coalescence to occur, for the branches do not appear to have been crossed. Probably it took place when the tree was young, and the branches concerned have since much increased in girth.

WHY DID THIS TREE DIE?

We invite our readers to put this question whenever they encounter a dead or moribund tree. They will find the investigation one of very considerable interest and difficulty. Why should any tree ever have its normal span of life shortened? Why, indeed, should that span have its limitations. A tree has no brain, and is not, therefore, liable to apoplexy; it has no windpipe, and cannot have croup; no heart, and is therefore not liable to valvular disease or hypertrophy, nor do we suppose that trees are prone to catch any maladies analogous to typhoid, cholera or small-pox. Trees cannot indulge in intemperance, either of eating or drinking, nor, since they have no nerves, can they catch cold or have their functions deranged by shock or over-anxiety. With such extensive immunities from the many influences which render the life of animals at all times precarious, it may almost excite wonder that trees should ever die. The truth is that, as compared with animals, they but rarely do die, and when mortality does happen to them it is, for the most part, in infancy. In very early life, when its whole organism is concentrated in a slender stem, a delicate rootlet and a few leaves, it is easy to conceive that its career may be cut short by a worm at the root, a caterpillar or a fungus on its foliage, or a few weeks' frost or drought. After it has attained its growth such influences would be powerless in their triviality. We will confine our attention for the present to what may be called the premature death of trees, and will leave for another occasion any detail as to their death from senility.

The causes of such forms of death as we are contemplating may be fairly classified as follows :—

(1) Exposure to severe cold.

(2) Exposure to heat, as from fires.

(3) Drought.

(4) Exhaustion of the soil—overcrowding.

(5) Poisoning of the soil.

(6) Attacks of fungus—(1) on the roots; (2) on the stem; (3) on the leaves.

(7) Lightning strokes.

These causes of danger may be divided into those likely to act slowly and those which would be sudden. In the former may be placed 1, 2, 3 and 7, for it is presupposed that the tree is grown in a climate that suits it, and that it is not likely to be hurt by any ordinary seasonal changes. When, however, extreme cold occurs, and especially in exposed situations, vigorous and healthy trees may be frozen or chilled beyond recovery, and may be found in the spring to be either unable to renew the distribution of sap, or doing so with such feebleness that they are sure to succumb next winter. The probability that cold has killed a tree is much increased if others of the same kind have suffered, and if those have suffered most which were most exposed. When cold injures a tree it does so by its influence on the branches and leaves, if any present, not on the roots.

[The above fragment must stand as the introduction to a series of papers on the causes of death of trees which we have in preparation.—Ed.]

NOTES ON SOCIAL HISTORY.

A Salisbury Church Register.

Mr. T. H. Baker, F.R.M.S., J.P., the well-known Wiltshire antiquary, has kindly favoured us with a copy of his Notes on St. Martin's Church and Parish, Salisbury. There are numerous interesting extracts from the churchwarden's book (1567 onwards). Those concerning the destruction of vermin are as follows:—

		s	d
1679	payd Thomas Colier for kiling a fox	1	0
1681	Paid for a ffox Head	1	0
1693	July 24. pd Jo^{n} Silcox for a Stote and Polecatt's head	0	8
	pd John Silcock for a grey's head	1	0
	pd John Harris for polecatts heads	0	8
	pd John Harris for a polecatt's head	0	4
1758	For an Otter	2	6
1758	Sep ye 16 for a Hedghog	0	2
1766	To Jno Hill for an Otter	2	0
1767	Nov. 9. Pd. Seal for killing 6 Hedgehoggs ...	2	0
1791	Curtis for 5 Stoats	1	8

The following deserve quotation because of their quaintness or historical interest:—

1581	Charges about the new Bell.	
	It. for unhanging of him	xviij^{d}
	for drawing him to the Bellfonders house ...	xj^{d}
	for bringinge the Bell to church	xvij^{d}
	for getting of her up and hanging of hir ...	iij^{s} vj^{d}
1588	paid to the painter in wrytinge the quene's m^{h}'s name in letres of gould wth a posy ...	iiij^{s}
	It. to a poure man that whipped the dogges ...	iiij^{d}
1590	It. paid to a sommer for the warninge for to kepe holyday for the tryumpe of the victory ouer oure enymyes	iiij^{d}
1599	Payd to the Ringers on the day of the overthrowe of the Spanierds on ow^{r} coste ...	iij^{s} vj^{d}
1603	Layed out for the Boke called the "Paraphrase of Erasmus vpon the newe Testament" ...	xiij^{s} iiij^{d}
	Item laied out for makinge a Desk and A chayne for this Booke	xviij^{d}
1605	for ye Ringers on the tryumph the 5 of November	iij^{s} iiij^{d}
1606	for the Ringers at the Birth of the Kinge ...	v^{s}

1610	Layd out for the Lampe.	
	The prise of the Lampe at London	lv^{s}
	ffor William Creeds paynes that bought it and for the Carriage of it Downe	ij^{s}
	ffor a pulley	vj^{d}
	ffor the Lyne to hange it wth all	xviij^{d}
	ffor two Iron Crookes and nayles	vj^{d}
	ffor his paynes that hanged it up	v^{d}
1628	ffeb 12. pd goodman beckam for a frame for bowes and arrowes	4d
1629	pd for a newe iron for the hower glasse ...	2^{s} 6d
1637	It. paid for 2 bookes for the fasting wensddies	02 04
1663	for the Act concerning fire Hearths	6d
1671	for bringing the Carnis book for the fast ...	1^{s}

Maundy Money.

The Money so called, was coined expressly to allow the King or Queen to discharge the ancient duty of giving to as many poor persons as the years of his own age, a like number of silver coins. The money was given in a white leather bag, and was to consist of pennies, two-penny, three-penny, and four-penny pieces, with sixpences and shillings, usually, it is said, to the amount of four pounds to each person. When the smaller silver coins had fallen into disuse they were still coined expressly for this purpose, but were usually very thin and poor.

With the Maundy coins were given bread, fish, ale, shoes, stockings and cloth. The King used at the same time to wash the feet of the men, and the Queen of the women, but after the reign of James II. this duty was delegated to the Archbishop of Canterbury, later still to the King's Almoner, and finally it fell into disuse.

The distribution of Royal Alms on Maundy Thursday still exists in a much modified form. Silver pennies for this purpose have been coined in the present reign.

The word "Maundy" possibly refers to the baskets (Maunds) in which the provisions were given. Maundy

Thursday was also known as Shere Thursday, "because antiently people would that day shere theye hedes and clypp theyr berdes, and so make them honest against Easter day."

The Discovery of Spectacles.

At a recent meeting of the Berlin Society of the History of the Natural Sciences and Medicine, Professor Julius Hirschberg presented a communication dealing with the history of the discovery of spectacles. He said that lenses for the improvement of the visual power were unknown among ancient peoples, whether Egyptians, Greeks, or Romans. They knew and used the art of polishing glass and rock crystal, but they were unacquainted with the use of these substances as aids to the eye. This is shown by many passages in Pliny and Seneca. The Emperor Nero had a smaragdus which he used as an eyeglass, but it is not clear whether or not it was a concave lens. The Chinese and Arabs had no earlier knowledge of spectacles than Europeans. The Chinese, indeed, long before the Christian era, had various kinds of concave mirrors, but they did not use them as spectacles. The statement of a French investigator that spectacles are an ancient discovery of the Chinese is erroneous, and according to Professor Hirschberg it is certain that spectacles were introduced into China from Europe in the fifteenth century. In the Talmud there is no mention of spectacles. The first certain reference dates from the year 1270. The Englishman, Roger Bacon, seems to have been the first who did anything towards the discovery of spectacles. He lived from 1214 to 1294, studied at Oxford and Paris, and taught at Oxford, where his learning gained for him the name of Doctor Mirabilis. He determined the position of the focal point in spherical concave reflectors, and gave directions for the making of parabolic burning glasses. In 1267 he had to clear himself from a charge of being a magician. He did this in his *Opus Majus*, in which he set forth his numerous optical experiments and discoveries. In it he speaks of magnifying glasses, which he said were useful to old people by making them see better. We hear in this book for the first time of the magnifying glass and its use. The actual discoverer of spectacles was probably Salvino degli Armati, a Florentine nobleman who died in 1317. Much was done for the popularisation of spectacles by the Dominican friar, Alexander von Spina, who died in 1338. The spectacles first constructed were convex, and there is proof of their use since the middle of the fourteenth century. We hear first of concave glasses for short-sighted persons

about the middle of the sixteenth century. Cylindrical spectacles first came into use in the nineteenth century. The first spectacles were hung from the cap ; later the bridge of the nose was utilised as a support for the frame. The German word *Brille* for spectacles, comes from the Latin *beryllium*, which in the Middle Ages was equivalent to glass, and may be traced back to an Indian root. Professor Hirschberg points out that some painters of the sixteenth century who represent persons of early Christian times as wearing spectacles on their noses, were guilty of an anachronism. He adds, that the notion which prevailed so long that St. Jerome, who lived in the fourth century, was the discoverer of spectacles is altogether unfounded.—(From the *British Medical Journal.*)

Common Salt.

Whenever common salt is scarce it will command almost any price, for it is essential to health and to the comfort of life. All classes, poor as well as rich, desire it, and this fact has unfortunately induced many governments to put heavy taxes on it. To the disgrace of our boasted civilisation and our humanitarian professions, the manufacture of salt is still throughout our Indian Empire a Government monopoly! To such an extent does this enhance its price that many of the poor are driven to use a black earth which contains salt in place of the wholesome article.

We note with very great pleasure that an important reduction in this tax has recently been made. It is in succession to several others in former years. The tax is now in amount insignificant, but it serves to treble the price, and is onerous exactly where most injurious. Simultaneously with the reductions there has been a very large increase in consumption, thus affording proof that the tax did really hinder the use of an article of the utmost importance to health. There is good reason to believe that a restricted supply of salt has much to do with the prevalence of leprosy. The poor Indian ryot owes much to what has been already done in this matter by Lord George Hamilton, Lord Curzon, and Mr. John Morley.

To the latter it is confidently hoped that we may look for the total abolition of the tax within very few years. There should be no delay in the removal of this blot on the good name of Britain.

Samian Ware.

What is called Samian Ware is the handsome red and usually glazed pottery which the Romans used as their best. A correspondent asks us, Where was that made which is now found in connection with Roman houses in England? Was there any British pottery for Samian? In answer we may say that it is frequently found, though not of best quality, in burials which were before the Roman period.

It is conjectured that it was made in Eastern Gaul and imported *via* the Rhine. There was, so far as is known, no pottery for Samian in England.

Treatment of Lepers in the Maldon Hospital.

From the second volume of Mr. Thomas Wright's "History of Essex" (1836), vol. ii., p. 652, under description of Maldon, we have the following:—

"The hospital for lepers, dedicated to St. Giles, is said to have been founded by one of the kings of England; it was for the relief of the inhabitants, and stood in Little Maldon. The ruins of it, which were converted into a barn, were of stone, with a mixture of bricks, apparently Roman. *For the maintenance of this institution, the Master was to have all forfeitures of bread, beer, flesh, and fish, not fit to be eaten*, and if the warden did not duly discharge his trust, the hospital was to come to the Crown. In consequence of this regulation, on the mal-administration of Robert Mansfield, Master, who for three years had neglected his office, and in that space of time, had neither maintained a chaplain nor any leprous person; therefore, King Henry the Fourth took the institution into his own hands; but it was afterwards restored; and after Mansfield's death, was presented to by several persons, from 1422 to 1480."

OUR LEXICON PAGE.—EXPLANATION OF SCIENTIFIC TERMS.

(*Continued from p.* 510.)

The Age of Copper.—There is little doubt that copper was the metal which was earliest made use of by mankind. Its softness, however, was a great disadvantage, and as it was soon found that it could be made harder by mixing a little tin, bronze quickly superseded it. There is, then, no period of time which should be known as "the Copper age," and few tools made of pure copper have survived for our museums. For coins it came early into use, and, as most know, it is so still.

The Stone Age.—These immense periods of time comprise all the early stages of human civilisation during which stone implements were the only ones in use, and the metals were unknown. For a large part of the world the stone ages came to an end gradually about four thousand years ago, stone being superseded by bronze and iron. Some isolated races are, however, still in the stone stage. Stone tools were never in exclusive use, having always been helped out by those of wood, bone, teeth, shells, &c. The stone ages have been divided into three stages in reference to the amount of skill displayed in fashioning the implements. *Eolithic* are those of extreme antiquity, which show the least possible traces of human preparation. *Paleolithic*, those which are formed, and to some extent chipped, but not ground or even finely chipped. Lastly, *Neolithic* are those ground or chipped to fine edges and shaped for special purposes.

Proechidna.—This is the name given to an animal which in New Guinea takes the place of the Echidna of Australia. The prefix *pro* is probably intended to denote substitution. It is objectionable, since it is not in any way descriptive. The two animals are of different species, if not of different genera, having doubtless attained their distinctions as the result of long separation. The Proechidna has only three

digits bearing claws, whereas the echidna has five. *Echidna-tridactylata* and *Echidna-pentadactylata* might be better terms.

Echidna.—This name, which is Greek for a viper, is applied to several snakes. It has, however, of late been usurped by a now well-known Australian quadruped, which has only the most remote alliance with snakes. The student must be careful not to confuse Echidna with Echinus, since the latter, which is Greek for hedgehog, and is appropriated by the sea urchin, might seem much more descriptive of the porcupine-like animal which has by mistake got its name from that of a snake.

Echinate, covered with spines or prickles, like a hedgehog or a porcupine.

Aculeate, from the Latin *aculeus*, a prickle. Having prickles applicable to a less pronounced condition than that which should be termed echinate; prickly rather than spiny.

Setose, from *seta*, the Latin for a bristle, a short strong hair. Any animal or plant having strong, short hairs which do not amount to spines may be described as setose.

Echini, and Echinodermata, spiny-skinned. The names given to the large family of sea-urchins, the shelly investment of which is covered with spines. The latter term is, so far as derivation is concerned, applicable to a hedgehog, a porcupine, or an echidna, but is never so employed.

Diastema, a gap or cleft; a vacant space between objects standing in a row. The word is chiefly used in describing the arrangement of the teeth. If the teeth, as in the human mouth, touch each other by their sides, there is no diastema. When used in combination with other words it usually means an abnormal fissure or cleft.

Intercellular and Intracellular.—The one means between the cell structures and the other inside the cells themselves.

Mycologist or Fungologist.—Those who make a special study of the great family of plants to which mushrooms, toadstools and blights belong are called mycologists, or sometimes fungologists. The former is much to be preferred as being

wholly of Greek derivation, whilst fungologists is an ugly compound of Latin and Greek.

Endophytic, "inside of plants," growing in the substance of any vegetable (plant or tree).

Epiphytic, "outside of plants," growing on the surface (leaves, bark, or roots) of any vegetable.

Aerobic, requiring air in order to live; applied to bacteria.

Anaerobic, not requiring air or oxygen, even sometimes killed by them.

Rhizomorph, a developed form of the mycelium of fungi. It is named from its resemblance to a root. From the rhizomorph hyphæ may spring and grow into the wood itself. A Rhizomorph may be regarded as being itself the hypha of a fungus which has thickened and assumed the appearance of a root. They are met with either in earth or the bark of trees, and are often of great length and exactly like the slender roots of plants. Hence the name.

Lumen, the enclosed cavity of any tube.

Ozoto-bacter, a name given to a microscopic organism present in soils which has the power of fixing nitrogen. The bacteria feed on the carbohydrates, and by an oxidising process fix nitrogen. The bacterial activity produces acids, for which it is desirable to find a base, hence the great value of lime on many soils.

Diastase, a fungous product which has the power of converting starch into sugar.

Invertase, a fungous product or enzyme which has the power of splitting cane sugar and converting it into simpler forms.

Cytase, a fungous product which can dissolve cellulose.

Peptose, an enzyme which converts proteids into peptones.

Lipose, an enzyme which breaks up fatty oils.

Oxydase, an enzyme which effects oxidation and causes change of colour.

Hymenium.—"The base of an æcidial cup, formed by those hyphæ which produce the æcidio spores."—*Plowright.*

NOTES AND EXTRACTS.

(*Continued from p.* 548.)

STATISTICS as to the relative liability of trees to be struck by lightning, collected in Germany in the years 1879 and 1890, recorded as follows: fifty-six oaks, three or four pines, twenty or twenty-one firs, but not a single beech. It is said that beeches were more common than all the others put together.

The following note concerning Lightning and Trees, is taken from *Science Gossip*, 1883, p. 235:—"It is no uncommon thing to find the lower parts of a tree cut up by lightning while the upper portions and the highest branches are hardly, if at all, affected. Oaks, however, appear to be an exception to this general rule. Professor Colladon (who has long been studying the phenomenon in Switzerland) is of opinion that this partial attack is due to the fact that the upper parts of a tree contain more sugar than the lower, sugar being a good conductor of electricity." We do not believe that oaks are really any exception to this observation. They are seldom struck high up. Usually the current enters at the base of a dead branch.

We have suffered much this spring at Haslemere from heath fires, which in some instances have spread into plantations and woods. In a wood of large fir trees, which had been thus burnt, the men in charge on the following day poured bucketsful of water around the stems of the injured trees. The fire had been gone some hours. What would be gained by such a procedure? Gilbert White has recorded the belief that fire travelled down the roots of gorse and shrubs into the soil and made it barren for several years. In this instance, however, the wish was to save the trees, not the ground.

Vipers are still fairly common on the moors around Haslemere and Hindhead. Every summer we have specimens in our Vivarium. They will not feed, however, and about the end of a couple of months when they look thin, we liberate

them and replace them by others in better condition. Otherwise this long fast does not appear to incommode them. It is possible that they do catch a fly now and then, but they certainly never take the frogs or mice which are offered to them. The keeper of the reptile house at the "Zoo" tells us that he has a similar experience, and that only once has he known a viper feed. On that occasion the animal took two mice.

Mr. Swanton was shown, on the morning of March 21, in a clay pit near Haslemere, a remarkable nest which had just been exposed by a workman who was removing clay. It was in a spherical cavity, about one foot below the surface, and composed almost exclusively of the fur of the short-tailed field vole (*Microtus agrestis*). The man showed also a "mouse" of this species which he had killed the previous day. The nest was large, and it was computed that it contained the fur of at least twenty-five of these voles, possibly a great many more. Amongst the fur were two pairs of lower jaws of the Microtus and many odd incisor teeth. The man who had found it said that some little time afterwards he had seen a weasel trot up the brickyard with a "mouse" in its mouth and visit the spot where the nest had been found.

KEY TO THE PLATE OF SKULLS OF MAMMALS.

See Frontispiece for January.

(*a*) The frontal bone; (*b*) the nasal bone; (*c*) the upper jaw-bone; (*d*) the malar bone; (*e*) the temporal bone; (*f*) the parietal bone; (*g*) the occipital bone; (*i*) the intermaxillary bone; (*k*) the lower jaw.

Fig. 1. Skull of the Lama (*Lama glama*, formerly *Camelus lama*), one-third size.—The Lama is the Camel of America, but has no hump. It belongs to the *Ruminant ungulates*. There are no incisor teeth in the upper jaw. A large canine tooth is seen in both jaws, and between it and the molars there is a wide space (diastema).

Fig. 2. Skull of a Sloth (*Bradypus cuculliger*), two-thirds size.—The molar teeth are separate one from another, and are round. The nose and front face have the appearance of having been cut off (truncated).

Fig. 3. Skull of Hedgehog (*Erinaceus europeus*).—The Hedgehog is a good type of the Insectivora. The teeth are almost always different in the two jaws. Note that there is no trace of boundary of the orbit behind.

Fig. 4. Skull of Lynx (*Felis caracal*), one-half size.—This skull may be compared with that of a common cat, and is a good type of the feline branch of Carnivora. Note the large canine teeth, the carnassial molars, the orbital rim open behind, and the large auditory bulla.

Fig. 5. Front End of the Lower Jaw of the Colugo or Flying Lemur (*Galeopithecus variegatus*).—It is seen from above, in order to show the comb-like notching of the incisor teeth. The *Galeopithecus* constitutes an order by itself, and stands between the Bats and the Lemurs. These pectinated teeth are peculiar to this animal, or are approached only in certain Bats.

Fig. 6, *a* and *b*, Parts of the Upper and Lower Jaw of the Javan Loris (*Stenops javanicus*).

(*a*) The front of the lower jaw seen from above. There are six incisor teeth with two canines placed close to the sides of the outer ones.

(*b*) The front and canine teeth of the upper jaw. There are only two incisors.

Fig. 7. Skull of a Loris (*Stenops potto*). See figs. 6*a* and *b*.

Fig. 8. Skull of a Gibbon, or Javan Ape (*Hylobates leuciscus*), one-half size.—The orbits are large and are directed straight forward. The canine teeth are large. The number and arrangement of teeth is the same as that of man. The forehead is low, and both jaws project (prognathous). The posterior margin of the orbit is complete.

STRUCTURAL ADAPTATIONS.

In our frontispiece, exhibiting the bones of the head of the Hippopotamus, there is amongst many features of interest one which should at once attract notice. The eye-sockets are not placed on the sides or front of its face as in most other animals, but high up on its skull. In this formation it has parallels in the crocodile and the bull-frog. The graphic illustration now given enables us at a glance to appreciate the advantages

which the animal secures from this position of its orbits. It can swim with the whole of its immense and heavy carcase under water, and with but few parts exposed excepting its nostrils, its eyes and its ears. Not only does it thus acquire buoyancy in the act of swimming, but it is enabled to conceal itself when at rest. One of its favourite positions is indeed that of basking in water just deep enough to well

cover its back, and in this position only the experienced eye can detect its whereabouts. The similarity of habit in this respect to those of the crocodile and frog, will be at once obvious.

We have here a very definite example of an acquired adaptation transmitted by inheritance. The orbits of the land-living relations of the Hippopotamus are not so placed, and we may safely believe that it has been as the result of constant efforts to lift the eyes that they have been by slow degrees made to travel upwards into their present position.

There is, however, another and yet more remarkable adaptive peculiarity in the Hippo orbit to which we must ask attention. Unfortunately it is not possible to display it in a photograph, and the skull itself must be consulted in order to realise its nature. There exists inside the orbit, so placed as to lift and support the eye, a large, hollow, bony cushion. It is formed by a layer of bone, hardly thicker than paper, and so delicate that in most museum-specimens it has been broken away. In some instances of adult or old animals it is as large as a duck's egg, whilst in young ones it is but small. To this structure, well known to zoologists, the name of orbital bulla has been given. The bone from which it is developed is, of course, present in all mammals. It varies very much in size, and in many species forms a considerable part of the floor of the orbit, but lies flat and shows no tendency to form a bulla. There are traces of bulla formation in the orbit of the Giraffe, and it may be remembered that that animal in browsing on the twigs of trees has occasion for the elevation of its eyeballs.

Perhaps no more definite and instructive example of adaptation of structure to the needs of the animal can be pointed out than the elevation of the orbit in the skull of the Hippopotamus and the development of the bulla in its floor. It was partly in reference to them that we have insisted on the great value of this skull in all educational museums.

INFLUENCE OF CLIMATE AND FOOD ON THE ANTLERS OF THE RED DEER.

It is of great importance to illustrate the influence of change of surroundings, food, climate, &c., on the physical development of living beings. We could scarcely choose a more instructive example than is displayed in the two figures

HEAD AND ANTLERS OF RED DEER FROM SCOTCH HIGHLANDS.

which are here reproduced. The one represents the head and antlers of a stag shot in the Highlands, and the other that of a stag reared from the same stock, but bred in New Zealand.

In the latter the antlers have become massive, angular and almost clumsy. They contrast strongly with the light, gracefully curved and rounded antlers of the other. In particular we may note that the terminal tines have coalesced, broadened, and constitute the "saucer," which is a characteristic feature

HEAD AND ANTLERS OF A RED DEER FROM NEW ZEALAND.

in some other species. The whole face is also broader and heavier.

These changes have been induced it is believed in a comparatively short period. Red deer were first introduced from Scotland into New Zealand about the middle of the last century. A second batch were sent by the late Prince Albert a few years after the first. They acclimatised readily and

soon increased so as to be a nuisance to the settlers. They attained a large size, and it is probable had met with a better supply of food and a far less inclement winter than they had been accustomed to in their Highland haunts. The illustrations are reproduced from originals given in the *Field* some years ago. We believe that somewhat similar changes are occasionally seen in stags in Hungary, and also that they are not invariable in New Zealand.

DORMANT BUDS ON LARCHES.

The study of what are known as dormant buds is of much interest. The term is applicable to all buds which have remained for prolonged periods undeveloped. In some, perhaps in most, instances they may have been promised growth at some former period, and then neglected and suppressed in the onward growth of the tree. The sap was attracted upwards more powerfully, and the bud left exposed by the fall of its protecting leaf, and, unfed, has dwindled and been covered over by the growing bark. Although, however, covered and suppressed entirely so far as any outward signs either of life or even existence were concerned, the bud was not dead. Under special conditions such buds may manifest their presence unexpectedly. If a large part of the parent tree be destroyed, what remains will bud out at various places, or if some part of the bark be subjected to special forms of irritation, sap may be attracted to the part, and dormant buds will sprout up and may even multiply themselves by lateral offspring. Such is probably the origin of the "witches' scrubbing brush" so common on oaks.

As a rule the conifer tribe rarely afford evidences of latent or dormant buds. If you cut a fir tree down the stump dies and does not sprout. Nor do conifers as a rule grow new branches where they have been lopped. In these statements,

however, the larch (which in several other features differs much from its relations) offers an exception. If an observer who has the opportunity will look at a young larch at the present season, he will find many indications of growth from latent buds. They occur chiefly near the base of little branches which have died or been cut off. They are not, however, so close to the scar as to suggest outgrowth from the stump of the last twig, and in some instances they may be found on the bole where no indication of loss or damage can be traced. A little green plumule, with scales at its base, is the characteristic at the present season. These are the quite new growths, but on many large boles numerous small twigs are present which have resulted from such buds in former years. The new buds are always found on the side of the tree most exposed to warmth and light.

SEASONAL NOTES.

April showers do not promote the growth of many fungi; the soil is not so warm as it is in September, when autumnal rains, as we have already noted, quicken into active growth the mycelium of an enormous assemblage of species. September and October are by far the busiest months for the mycologist, but a good deal of observation may be done in April.

The student will be able to collect a few well characterised agarics, several highly interesting species of the larger ascomycetes, and, late in the month, will be able to investigate, with the aid of the microscope, the beautiful little rust fungi (Uredines) then appearing on the leaves of many wild plants. One of the earliest of the Uredines is the Moschatel fungus. The mycelium is perennial, and the black pustules of the fungal flowers (technically the mass of

teleutospores) may be commonly found on the leaves of this insignificant yet beautiful plant throughout April and May. In reply to a query, we have given in the correspondence column a list of the Uredines which appear in May.

Of agarics, the most noticeable is the St. George Mushroom (*Tricholoma gambosum*), so-called because it generally makes its appearance on downs and open pastures about the 23rd of April, the day dedicated to St. George. It grows in circles, emerging from the ground as a little whitish ball, which gradually becomes an agaric varying from 2 to 6 inches in the diameter of its biscuit-coloured pileus. It is of the same stature as the common edible mushroom, but is very distinct in having white instead of purple-brown or pink gills and spores. The smell is strong but not unpleasant, being somewhat like that of new meal.

The Buckler (*Entoloma clypeatum*) is a gregarious species not uncommon in spring and autumn in woods and in fields bordering them. It is large and fragile, almost 3 inches across the pileus, with a hollow, fibrous stem nearly 4 inches in length. Moist and livid at first, it is dry and spotted at maturity. The spores are rosy or salmon-coloured. A very poisonous species.

The White-cap (*Clitocybe cerussata*) may be found amongst dead leaves in fir and mixed woods. Entire plant white. The glabrous pileus varies from 1 to 3 inches across. The gills are at first adnate, then decurrent, always much crowded and thin; spores white; stem solid, elastic and tough; about 2 inches long.

The little Button Omphalia (*O. fibula*) occurs throughout the winter and early spring in damp places amongst moss, especially on oak trunks near their base and on burnt ground. The yellowish or orange pileus does not exceed half an inch in diameter. It is thin but tough; hemispherical at first, at maturity it is funnel shaped. The gills are whitish and deeply decurrent. The stem is about 1 inch in length.

There are three cup fungi (Pezizæ) appearing in April which deserve comment.

The scented Elf-cup (*Peziza venosa*) may be easily recognised by its strong nitrous smell. The umber-brown cup (whitish outside) is about 2 inches broad and as many high. Its margin is more or less wavy and lobed, and the stem is short and indistinct.

Another common species on roadsides and in woods is the Chalice (*Acetabula vulgaris*). It differs from the Scented Elf-cup in having many strong branching veins or ribs on the stems, and in the absence of nitrous smell; moreover, it is usually solitary, *P. venosa* being a gregarious species.

A far more local fungus is the great Reticulated Elf-cup (*P. reticulata*), the largest of our largest species. The reddish-brown cup varies from 2 to 5 inches across, and is ornamented with an irregular network of raised ribs. "In the last stage the pileus is nearly spread out on every side so as to rest on the ground, the extreme margin, however, still retaining its involute tendency." Said to be a solitary species, but we have on several occasions found groups of seven or eight plants in hedges in East Somerset.

In the Pezizæ group the cup—or ascophore as it is termed—is incurved at first, and gradually develops. An allied group—the Helvelleæ—differs in having the disc or hymenium exposed from the first. This group probably contains more vernal fungi than any other; and we will conclude our remarks on April fungals with a brief reference to some of them.

One, the *Mitrula phalloides*, has already been described under Seasonal Notes for May (see p. 30).

The Mitred Helvel (*Helvella lacunosa*), as indicated by its specific name, has a remarkably pitted or ribbed stem. In all the Helvels the pileus consists of crisped, wavy and drooping lobes attached to the stem by the under surface. In the present species it is blackish-grey, the stem being whitish.

It occurs on the ground, in woods and under hedges, in spring and autumn, and is very variable in size, usually about three inches high.

The Thimble Finger (*Verpa digitaliformis*) consists of an umber-brown cap, three-quarter inch high, surmounting a pinkish stem (three inches) in the same manner as a thimble on a finger. It may be found in hedgerows and under shrubs in gardens.

The common Morel (*Morchella esculenta*) is a well known vernal fungus, esteemed by mycophagists as a great delicacy. The Morels (there are five British species) are easily recognised by the peculiar ribs which cover the surface of the cap in a more or less polygonal manner. In the Common Morel the pileus at its base is joined to the stem, which is whitish, and usually hollow. It is a frequent species on limestone soils, and has a predilection for the neighbourhood of elm trees. Very excellent coloured figures, by far the best we have seen, of many of the ascomycetes noted above, are contained in the "Nouvel Atlas de Poches des Champignons," par Paul Dumée, published by M. Paul Klincksieck, 3 Rue Corneille, Paris. Price 5s.

The following flowers may be found in April, also the majority of those alluded to in our Seasonal Notes of the past three months: Cuckoo Pint, Wood Crowfoot, Dove's Foot, Crane's Bill, Spring Vetch, Chervil or Cow Parsley, Moschatel, Ash, Toothwort, Ivy-leaved Speedwell, Germander Speedwell, Vernal Speedwell, Ground Ivy, Wood Spurge, Beech, Box, Oak, Larch, Hornbeam, Sweet Violet, Dog Violet, Periwinkle, Early Orchis, and various species of Willows and Poplars.

March is the month "when rosy plumelets tuft the larch." Two or three were to be seen last year on a tree near Haslemere Church on March 9, but they are more abundant late in the month, and are at their best in April. The "rosy

plumelets" are the female flowers; they will develop into cones later in the year. The larch is monœcious, having the male and female flowers separate, but on the same tree, like alder, hazel and others. It is the most prolific of our conifers. It is not a native tree; it was introduced in 1629.

Every reader knows the rustic saying:

> "If the oak's before the ash,
> There will only be a splash,
> But if the ash is before the oak,
> There's sure to be a heavy soak."

The ash is seldom in leaf before the oak. Given a high temperature, no doubt the ash would unfold its buds earlier than usual, but so with all other trees. At the time of writing the reddish buds of the oak are on the point of bursting, but the very dark, almost black ones of the ash remain tightly closed and hard.

Now is a good time to study buds. The symmetrical arrangement and the beautiful colouring of the scales which usually protect them are seen best with a good powerful pocket lens. A bud is a shortened leaf-bearing axis, which, by elongation, forms a stem or a branch. It may be terminal, *i.e.*, seated at the tip of a branch or stem, or it may be lateral, *i.e.*, produced at the side of the axis.

The individual flowers of the Arum are extremely simple. They have no conspicuous corolla or calyx. The pistil-bearers are little more than seed-capsules with their seeds and stigmas, and the stamen-flowers may be nothing more than single stamens of anthers, for the latter are sessile, and not provided with a stem or filament. A moment's thought will convince any one that, for the individual flowers, no calyx or corolla is needed. These structures are for the purpose of wrappage and in order to attract insects. These ends are fully served by the Spathe, which, whether green, white, or coloured, is a conspicuous object. The white Arum probably attracts night-insects and the coloured ones those which fly by day. The lower part of the spathe affords admirable pro-

tection to the flowers against injury from wind, cold or rain. *A propos* of this protection of the spadix by the spathe, the interesting fact may be mentioned that the use of the thermometer during the flowering stage shows that the chamber enclosed by the spathe is hotter than the surrounding air. Thus we have proof that heat may be generated during life processes in vegetables just as it is in most animals. The Arum may be described as a warm-sapped plant. It is, however, appreciable only during flowering, and its amount is too small to admit of the plant being put to a practical use as a means of warming the drawing-room.

The small white midges which may almost always be found at the base of the spathe are known as *Pyschoda phallænoides*.

Excepting in gardens, the cowslip is rarely to be seen near Haslemere. It is a lover of clay, and does not thrive well upon sand. Wherever cowslips and primroses occur together we may expect to find the so-called "oxlip," a hybrid between the two. The true oxlip (*Primula elatior*) is a distinct species occurring only in one or two of the eastern counties. Cowslips quickly assume a large size if grown in gardens under favourable conditions. They then much resemble the hybrid oxlip, but may be recognised by the deeper yellow of the corolla and the more sharply defined orange lines at the base of each segment.

On sunny days in April and May the curious little Humble-bee Fly (*Bombylius*) may be seen in open glades in woods hovering over the primroses, and extracting the nectar from them by its long proboscis. It much resembles a Humble Bee in the hairiness of its body and the manner of flight, and through this resemblance is said to escape experimental tasting by birds.

In April slugs emerge from their winter retreats, and gardeners anxious for the welfare of their crops should pursue them ruthlessly.

There are many species; they may be arranged in three divisions:—

(1) The shell-slugs (*Testacellidæ*). Carnivorous and subterranean forms remarkable in having an external shell situated on the tip of the tail. They are aliens, and rarely met with except in large nursery gardens. They prey upon earthworms and small slugs, and are therefore gardeners' friends.

(2) The true-slugs (*Limacidæ*). Shell concealed beneath the mantle, the breathing orifice situated on its anterior part. This division includes (with many others) the well-known *Limax maximus*, the largest British species. It is a grey slug, usually spotted with black on the mantle, and having black lines on the body. It may be found around pumps and in other damp situations.

It is infested with a minute parasitic mite (*Philodromus*) which can be detected with the unaided eye as it runs in and out of the breathing orifice.

(3) The snail-slugs (*Arionidæ*). These differ from the true slugs in having the breathing orifice situated towards the front of the mantle, or nearer to the tentacles.

The common black slug of the hedges and fields (*Arion ater*) is a well-known representative of the group. It is also infested with the mite alluded to. This slug is subject to great variation in colour, being sometimes red, brown, and even yellow or white. The members of this division are well-known garden pests, the greatest offender being the little white or speckled field slug, *Agriolimax agrestis* (see p. 218).

Birds that nest in April and May are: The Ring Ouzel, chiefly in the West and Midlands in moorland and mountainous localities. It much resembles the Blackbird in habit, but may be at once distinguished by the white throat-band. It visits Hindhead and Haslemere for short stays in Spring and Autumn, probably on its way to and from Dartmoor (see White's "Selborne"). The Stonechat nests at the base of a furze-bush on commons. The Dartford Warbler or Furze

46

Wren nests in similar localities, chiefly in the southern counties. Golden-crested Wren, our smallest bird ; it hangs its nest usually on the bough of a spruce. The Dipper, or Water-Ouzel, nests in the neighbourhood of mountain torrents. Bearded Titmouse, Great Titmouse, Coal Titmouse, Marsh Titmouse (the only Tit that lines its nest with willow down), Blue Titmouse, Crested Titmouse (in Great Britain breeding only in certain pine forests in Scotland), Nuthatch, Wren, Tree Creeper, Pied Wagtail, Grey Wagtail, Yellow Wagtail, Meadow Pipit, Rock Pipit (nests on rocky sea-coasts), Greenfinch, Siskin (breeds for the most part in northern fir woods), House Sparrow, Tree Sparrow (may be known from the House Sparrow by the white collar almost surrounding the neck and the chestnut-brown head ; House Sparrows often nest in trees near houses, the Tree Sparrow is a shyer bird, seldom found near houses), Chaffinch, Linnet, Bullfinch. Yellowhammer, Starling, Chough (sea-cliffs in Cornwall, Devon, Channel Islands, Lundy Isle, and West Wales), Magpie, Carrion Crow, Skylark, White or Barn Owl, Marsh Harrier, Common Buzzard (forests in the mountains of the West, Wales, and Scotland), Golden Eagle (Highlands and Western Islands of Scotland only), White-tailed or Sea Eagle (Irish coast and some Scottish islands), Peregrine Falcon (sea cliffs), Merlin (chiefly on northern moors), Kestrel, Common Cormorant, Shag, Mute Swan, Sheld Duck, Wild Duck, Water Rail, Coot, Lapwing or Peewit, Common Snipe, Redshank, Curlew, Black-headed Gull, and Common Gull.

For the following notes on Entomology in April we are indebted to Mr. F. Oldaker, the Honorary Secretary to the Haslemere Natural History Society.

If the weather is at all propitious, the work of the entomologist begins in earnest this month. The hibernating butterflies have already been coming out on warm sunny days for some time past, but one may now reasonably expect to find them depositing their ova. And the spring broods of

several species may now be looked for, such as the three "Whites," the Orange Tip, the Holly Blue and the Common Blue, the Small Copper and the Grizzled and Dingy Skippers. It is worth observing that the early brood of the "Whites" differs from the autumn brood in the intensity and size of the dark markings, and the size and position of the dark spot on the upper wing of the male Orange Tip is subject to some variation. The Small Copper is also a very variable insect.

Most of the hibernating larvæ are now feeding, and a search among the whitethorn bushes with a lantern after dusk is likely to prove profitable. The large and handsome larva of the Lappet Moth, and the larvæ of several species of Yellow Underwings, can be found in this way, and from now till their time of pupation in early summer they will be very voracious. It is therefore of the utmost importance to keep them supplied with an abundance of fresh food, and at the same time to give them plenty of air space. The size of the resultant imagines depends to a great extent on this, especially during the period immediately before pupation, when they not only eat a great deal, but they also take a great deal of exercise.

Many larvæ will have already emerged from the egg, and in many cases diligent search has to be made for food far enough advanced for them. One precocious larva of the pretty little silver-studded Blue, which is to be found in the clearings near the Inval Woods, Haslemere, had the temerity to appear on March 19, far in advance of his fellows, and a careful search had to be made for Bird's Foot Trefoil, which was only just beginning to shoot forth. It is to be observed that the egg of this species is an object of peculiar beauty when seen under a microscope.

IGHTHAM.

About one mile north of a line drawn between the towns of Sevenoaks and Maidstone, and about four miles from the former town as the crow flies, and twelve from the latter, lies the little village of Ightham. It is well known by name, if not by visitation, to most British archæologists as the home of Mr. Benjamin Harrison, who will always be remembered in connection with his discovery in the neighbourhood of Ightham of those rude human implements of flint to which the name "eoliths" has been applied, and concerning which there has been much controversy of late years.

The history of this village has been recently written by Mr. F. J. Bennett, F.G.S., in collaboration with several specialists.[1]

From the introduction we gather that Mr. Harrison, though repeatedly asked to do so, has always shrunk from publishing the history of what he has happily termed "his world," and "it is only because it seemed imperative, that the present writers have ventured to do what might apparently have been more appropriately done by Mr. Harrison himself."

It was Sir Joseph Prestwich's paper read before the Royal Society in 1859, that first put Mr. Harrison searching, not only for palæolithic implements in the valley gravel deposits of his district, but also, by inductive reasoning, for still older traces of man on the highest ground near him, the plateau of the South Downs. Here he found rudely chipped flints, quite distinct from the "palæoliths" of the valleys, which he classified, arranged, and kept until 1888, when he exhibited

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[1] Ightham: the Story of a Kentish Village and its Surroundings. By F. J. Bennett, F.G.S. (late of H.M. Geological Survey). With contributions by W. J. Lewis Abbott, F.G.S., E. W. Filkins, Benjamin Harrison, J. Russell Larkby, J. Scott Temple, and H. J. Osborne White, F.G.S. With 40 illustrations, plans and maps. 7s. 6d. net. The Homeland Association, Limited, 22, Bride Lane, Fleet Street, E.C.

them to Sir Joseph Prestwich, who after much careful consideration, accepted them as exhibiting traces of man's handiwork, and as such brought them to the notice of his friends of the Geological Society in 1890.

In the book before us the story of the development of flint implements, with special reference to those of Ightham, has been treated very thoroughly by Mr. J. Russell Larkby, and illustrated with some admirable photographs by Mr. H. Elgar, of implements now in the Maidstone Museum collection.

Addington Park Cromlech.

Mr. Bennett has written some valuable chapters on the geology of the district, and has also contributed three chapters to the Palæolithic, Neolithic and Megalithic periods, with illustrations. Through the courtesy of the publishers we are enabled to reproduce two of these, viz., Kit's Coty, and the fallen Cromlech in Addington Park, from photographs taken by Mr. H. Elgar, of the Maidstone Museum.

Discussing the question of the position of these megalithic remains, Mr. Bennett remarks, "This we have noticed is along a north and south line in the case of Coldrum and Addington, and also in the case of Horstead, Kit's Coty, and countless stones. North again of Coldrum are some thirty sarsen stones, some of large size, in a hole in Cockadamshaw Wood; and half a mile north of Cobham Church the remains of another stone circle, a total of five megaliths along a north and south line. This fact at once recalled to our mind that we had noted many years ago that Avebury, Silbury, and the stone circle south of it known as Little Stonehenge, were along a north and south line, and were in each case one mile apart, as Coldrum is from Addington." Mr. Bennett gives plans showing north and south position of Avebury, Stonehenge, &c., and also the Kentish megaliths.

The chapters on historical Ightham have been contributed by Mr. J. Scott Temple, and the interesting old Mote House has been described by Mr. Edward Filkins. The first recorded owner of the mote was Sir Ivo de Haut (*temp.* 1180), a table shows the subsequent owners. In 1483 it was in the possession of Sir Robert Brackenbury, Governor of the Tower of London, who was killed at the battle of Bosworth Field.

The ossiferous fissures of the valley of the Shode are dealt with by Mr. W. Lewis Abbott, who remarks that "four years before the commencement of the working of these fissures, Professor Prestwich brought out his classic text-book, in which he gives the total number of vertebrates from the Pleistocene caves and fissures as thirty-seven. But the Ightham fissures have brought the list up to over one hundred species. Nor is the invertebrate list very much less interesting, opening up, as it does, so many problems of great importance in connection with present day non-marine mollusca."

The most noteworthy of the mollusca discovered in these fissures is *Hygromia umbrosa*, *Partsch*, a species new to Britain.

We may remark that several printer's errors have escaped correction in this chapter.

There is a very useful bibliography of the principal works dealing with the geology and the flint implements of the Ightham district. In this connection it is stated that Professor Maccurdy was incorrect in stating that the term "Eolithic" was first used by the late Mr. J. Allen Brown. It would appear that an "Eolithic Period," anterior to the Palæolithic, is recognised in the tabular "classification of Post-Tertiary Times," by G. de Mortillet, in 1876, reproduced in the following year by Professor T. Rupert Jones in his "Lecture on the Antiquity of Man." Altogether this book, containing as it does, much matter of a great deal more than local interest, is a valuable addition to the history of British archæology and geology, and we cordially bring it to the notice of our readers.

Description of Plate. By kind permission of the Homeland Association. From photographs by Mr. H. Elgar, Maidstone. "The Addington 'circle' is in the form of a long oval, but only some twenty-two stones can now be seen. Many of these are at wide distances apart. At the east end of this oval is the Dolmen. One of the stones—all of which are large and compare thus with Coldrum—leans slightly, but the rest, to the number of four, are lying flat. Some little distance further east, are two more smaller stones close together, but their relation to the circle and Dolmen is not at all clear. The much better known Dolmen of Kit's Coty House stands as near as possible six miles due east of Coldrum and in full view of it, and we have evidence that its former condition was very different from its present one, for Mr. G. Payne, F.S.A., at p. 127 of his 'Collectanea Cantiana,' gives a letter from the Rev. W. E. Lukis, dated May 7th, 1883, stating that it was 'formerly a mound,' and that he had a letter written by one Hercules Ayleward to Dr. Stukeley, in 1723, from Mereworth Castle, Kent, describing the upper and lower Coty monuments as they existed at that time, together with

sketches. Kit's Coty is represented as being partly in a long barrow and the lower structure in ruins. He states that the former belonged to a Mr. John Taylor, 'a lover of antiquity, who would not for 100 guineas part with as much of the stone as would serve to set in a ring.' The latter was owned by

KIT'S COTY HOUSE.

Henry Beaumont, and was pulled down by the previous owners, John French and John Frankham. Further north, at about 80 yards from Kit's Coty, he speaks of a long rude prostrate stone called 'The General's Tombstone,' and further westward, towards the summit of the hill, in a coney warren, 'a parcel of small stones in the form of arcs of circles, and a double row of stones which he conjectures to be an avenue.'" (From the "Story of Ightham," p. 48.)

ILLUSTRATIONS OF FRENCH HISTORY.

A SPECIAL temporary collection of portraits, engravings, &c., illustrating the history of France, is in course of arrangement at the Haslemere Educational Museum. The following portraits and engravings, most of them coloured, have just been placed in swing frames. The expression "Group," denotes merely that the frames are hung in association. With them are a great number of uncoloured engravings, portraits, and illustrations of places of historical interest.

4 *Group I.*

(1) Francis I. 1494-1547.
(2) Claude, first wife of Francis I. 1499-1524.
(3) Eléanor d'Autriche. 1498-1558. Second wife of Francis I.
(4) Madame de Chasteaubriant (maitrésse de Francis I.).
(5) M. le Grant, Maistre de Boisy (helped to educate Francis).
(6) M. de Fleuranges. Reigns of Louis XII. and Francis I.

Group II.

(1) Henri II. 1518-1559. Son of Francis I.
(2) Catherine de Medicis, wife of Henri II. 1519-1589.
(3) Ditto (older).
(4) Francis II., eldest son of Henri II. 1544-60. (As an infant).
(5) Ditto (older).
(6) Marie Stuart. 1542-1587. Wife of Francis II..

Group III.

(1) Marie Stuart (older).
(2) Charles IX. 1550-1574. Second son of Henri II.
(3) Ditto (older).
(4) Elizabeth d'Autriche. 1554-1592. Wife of Charles IX., daughter of the Emperor Maximilien II.
(5) Maximilien II.
(6) Le Duc de la Valette né 1554, Admiral of France.

Group IV.

(1) Admiral Coligny.
(2) Ditto.
(3) Henri III. 1551-1589. Third son of Henri II.
(4) Louise de Lorraine. 1553-1601. Wife of Henri III.
(5) Ditto (older).
(6) Le Duc d'Alençon. 1554-1583. Fourth son of Henri II.

Group V.

(1) La Duchesse de Guise. 1531-1607. Wife of Francis de Lorraine.

(2) Dianè de Poitiers. 1499-1566 (maitresse de Henri II.).

(3) Dianè de Angouléme. 1538-1619. Daughter of Henri II. and Dianè de Poitiers.

(4) Le Duc de Joyeuse, Statesman (Henri III.).

(5) Gabrielle d'Estrées. 1571-1599. (Maitresse de Henri IV.).

(6) Princesse de Condé, wife of Louis, Prince de Condé.

Group VI.

(1) Marguerite d'Angouléme, Queen of Navarre. 1492-1549. Sister of Francis I.

(2) Ditto (older).

(3) Jeanne d'Albret, daughter of Marguerite d'Angouléme. 1528-1572. Mother of Henri IV.

(4) Antoine de Bourbon, husband of Jeanne d'Albret. King of Navarre. 1518-1562.

(5) Henri IV. of France and Navarre. 1553-1610.

(6) Marguerite de France. 1553-1615. First wife of Henri IV. or Valois.

The following are not grouped: 1. M. de Lautrect. 2. Md. de Simier. 3. Elizabeth Duval ? 4. Philippe Strozzi. 5. Ant. Caron-Pintre, 1592. 6. Pierre Quefnel, 1574. 7. Md. de Sauve (?) 8. Agnes Sorel. 9. M. de Quelus. 10. M. de Mogeron. 11. M. de Dunes (?) dù d'Entragues, 1576. 12. M. de St. Megrin.

DESCRIPTIONS OF MUSEUM SPECIMENS.

[*These descriptions are adapted for Museum Labels, and they may be had separately.*]

OPERCULA.

The soft-bodied animals (Mollusca) which have single and usually spiral shells, such as snails, whelks, &c., are able to withdraw their bodies into their shells. Firmly embedded in that part of the body (the foot) which is the last to pass into the shell, there is in many species a plate, sometimes of horny substance, but more usually of hard shell, which closes the opening as a sort of door, or rather flattened plug. It is a

kind of sole to the animal's "foot." To this substance the term *Operculum* is given.

Opercula vary much in size and thickness in different animals, and are sometimes ornamented by colours, and by a spiral pattern. The bivalve Mollusca have no opercula, nor do they need them, since they are completely protected by the second or flatter shell. It may be plausibly supposed that the opercula in univalves represent this second shell, from which they differ, however, in not being in any way hinged to the larger one. Some opercula are oval, but more usually they are round. They do not look like shells, and those which are coloured might be taken for discs of earthenware. Some of them are used as ornaments, but the majority present no particular beauty.

SHELLS OF A PHOLAS.

These shells are so thin and delicate that they are often called "paper-shells." For their protection the molluscs inhabiting them bore holes in rocks in which they lodge. Although so apparently fragile, they yet use the thicker end of their shells as a rasp, and by a rotary motion file away the rock until a hole is made. This is their only method of boring. It is a mistake to suppose that they secrete any acid which dissolves the stone. They bore into wood as well as stone.

THE HUMAN NOSE.

The human nose possesses :—

(1) A Bridge.

(2) A Ridge or slope.

(3) Wings or alæ.

(4) Tip or end.

(5) Nostrils.

The Bridge may be narrow or broad, high or low.

The Ridge may be straight or curved, and if curved the position of its curves may vary ; there may be one or two. If but one it may be convex or concave.

The Wings may be wide or narrow, and thick in the sense of fleshy, or thin and gristly. At their borders they may be straight or curved.

The Tip may be thin or thick, wide or narrow, projecting and curved downwards (hooked), or not projecting and turned upwards.

Below the nose, and enclosed by it, are the Nostrils, which may be wide or narrow, exposed or concealed, long or short.

The nose as a whole may be large, average, or small, well placed or awry. It may be well proportioned in relation to the lips, cheeks, and forehead, or not so.

The nose is supported by certain bones of the face, and these bones are the same in man and in animals, though with very wide differences as to their size. Two small bones, which join above with the forehead bone, are known as the nasal bones, and form the bridge. In animals with long noses they are very long, but in man they rarely exceed an inch. These bones form only in small part the sides of the nose, which are furnished by up-standing plates from the upper jaw bones (superior maxillæ), one on each side the principal bones of the face, and to a large extent by gristle or cartilage.

In its interior the nose is divided into two lateral chambers

by a central thin division, in part of bone and in part only gristle. If it were not for the support thus given, the lower two-thirds of the nose would sink down level with the face, for the little nasal bones give framework only of the bridge. This dividing and supporting structure may be destroyed by disease, or broken down by a blow or fall, and then the nose sinks or is twisted. These acquired peculiarities must be carefully excluded when we attempt to study the nose as a feature, and a part of the physiognomical cast of the countenance. In Michael Angelo's portrait a deflexion of the nose is represented, which was the result of a blow given by a fellow student in early life. The interior of the nose is rarely quite symmetrical, and a slight twist of its end to the right side has been supposed to be caused by the habitual use of the handkerchief in the right hand.

In describing and classifying noses the following terms may be conveniently used.

An *average nose;* this would mean that the organ was well placed, or usual size, and presented no peculiarities.

The epithets *large* and *small*, when applied to a nose otherwise average, explain themselves.

A *straight nose*, means a nose of which the ridge runs in a straight line from the bridge to the tip.

A *Grecian nose* is one in which the ridge presents a slight and graceful convexity and two very slight depressions.

A *Roman nose* is one in which the convexity is very considerable. It is a Duke of Wellington nose, and is often associated with some tendency to be hooked.

An *Aquiline nose*. This is the nose of the adult Jew. It has a high convexity and an excessive downward growth, so that the curve resembles that of a parrot's beak, and a shallow notch is produced in the borders of the wings. Possibly, however, a parrot nose should be distinguished from an aquiline one.

A *snub* nose. In this, the middle of the ridge is concave, and at the same time the end is somewhat thick.

A *tip-tilted nose.* In this, the *nez retroussé*, the end of the nose is turned slightly upwards. Usually the nose is a small one, and thin rather than snub. In some belief that it is a peculiarity derived by inheritance from a habit of turning up the nose, this peculiar form is supposed to imply a tendency to impertinence on occasion, and there is a Roumanian proverb to the effect that one up-tilted nose in a house is sufficient.

A Roman nose.
(A distinguished judge.)

An aquiline nose.
(That of Lorenzo de Medici.)

The *truncated* nose. In this the end of the nose is usually rather large, and looks as if the end had been cut off. It is well exemplified in Lord Brougham's nose.

The expression *horse-nosed*, is rather applicable to the whole face than to the nose alone. In it the whole face, from forehead to lips, is very long, and the nose both long and large, with a certain degree of curve backwards at the chin. It is, perhaps, equivalent to what is sometimes called hatchet-faced.

Many other terms might be suggested, but the above carefully used will suffice for useful descriptions of this important feature.

Although the bony framework of the face gives support to the nose and to some extent modifies its prominence and size, it must be understood that it is to certain gristly structures quite exterior to the bones that the various modifications which give personal peculiarity are chiefly due. A skull from

A truncated nose. A Brougham nose.
(That of a young Scotch boy.)

A snub, Socratic nose.
(That of a lowland Scotch farmer.)

which the soft parts have all been removed, although it may give the width of the nasal apertures and afford some clue to the width and prominence of the nose at its root, would not enable any judgment to be formed as to its character as a feature. The cartilages referred to are described in detail in all works on anatomy. Their arrangement and curvatures are complicated, and no good purpose would be attained by attempting their description here. It must be understood that they give the contour, that they are susceptible of endless

minor modifications in curve and size, and these modifications run in families, that is, are transmitted hereditarily. These cartilages develop from childhood to full adult age.

To these cartilages a number of little strips of muscle are attached, which enable their possessor to move the sides and tip. The ability to move the nose is possessed in very different degrees in different persons. Some of the most pronounced movements are accomplished in association with the upper lip.

Young Jew boy.

Jew girl of 16.

A middle-aged Jewess.

A large straight nose.
(That of a well-known jockey.)

The thickness of the skin covering the nose varies much in different persons, and may even in some instances modify the contour of the organ. An almost morbid tendency to thickening is often very definitely hereditary.

The junction of the nose with the forehead is sometimes called the summit, or better, the root. The lower part is the base. The tip is sometimes spoken of as the lobe, but it is a bad term.

Conclusions.

No attempt should be made to interpret in detail individual character by peculiarities in the form or size of the nose. One of the larger monkeys is known as "the proboscis monkey," on account of the great length of his nose, but it is not supposed that his character differs much from that of his snub-nosed relatives. In man we may often safely infer race or family, and may then cautiously attribute the known character of the race to the individual who possesses the nose. Thus the Roman nose indicates Italian descent, the aquiline nose Semitic descent, and so on. Many other races, or family groups, having noses more or less characteristic might be constructed. *Meanwhile the point to be kept in mind is that the nose comes by inheritance and indicates character only so far as it implies racial or family descent.*

REVIEWS.

The Evolution of Culture and Other Essays. By the late Lieutenant-General A. Lane-Fox, Pitt Rivers. The Clarendon Press, Oxford.

This book suggests a puzzled feeling of doubt as to whether it is a little behind the age or much ahead of it. It contains but little which will add to the stores of knowledge of the present-day student, whilst at the same time a conviction that the author, on sound lines, is aiming at a kind of accuracy in detail likely to be unattainable for long to come. It is the same with much of Herbert Spencer's writing. Both authors seem to be labouring to convince their readers that much of what has seemed quite obvious to common sense can be put into sound scientific phraseology if only you will take enough trouble. Yet we are very thankful, both to Spencer and General Lane-Fox. They had high aims, and have done good work. Their work has, however, been done,

and may now be left, at any rate, for the present. This remark is not intended to apply to the collections of facts which both these writers accumulated, but only to the conclusions which they endeavoured so laboriously to enforce. In the laudable desire to collect facts as this basis, Spencer was perhaps as zealous as Lane-Fox, but he had not his skill or energy. The latter was by instinct a museum maker, and he added to his zeal for accumulating objects a passion for their orderly arrangement. His museum of anthropology, now known as the Pitt Rivers Museum, at Oxford, is one of great and permanent value. Nor will the name of its founder ever take other than a foremost place in the history of the evolution of the human intellect, as viewed from the matter-of-fact side.

It is difficult, however, even after the perusal of these interesting papers, not to feel doubt as to whether the term "evolution" is quite applicable to what is called "culture." In a certain sense it is self-obvious, but the probabilities of spontaneous developments in different regions and amongst different races are so manifold that we cannot help feeling some doubt whether the so-called steps were in any way connected. All must, however, acknowledge that it is the right method of work, and accord respectful homage to our author as a foremost master in the art. The Pitt Rivers Dorsetshire Museum was one of much originality, and set an excellent example to country gentlemen of wealth. We extract from one of its founders addresses the following reference to it :—

"It would be a mistake, however, to suppose that the agricultural labourer can be reached by museums alone. Hodge, though better off than he has ever been before, is in a lower condition, morally and mentally, than at any previous period. He is too incessantly plied with pernicious doctrines to have a soul for anything above party politics. It is to the larger and smaller tradesmen in the towns and villages that such things as museums appeal, and, moreover, they must be supplemented by other inducements to make them attractive. Within a short distance of the Museum, I have formed a recreation ground, called the Larmer Grounds, where my private band plays

every Sunday in the summer months from three to five. This ground was attended during the last year by 16,839 persons from the neighbouring towns and villages. Not far off is an old house, formerly a hunting box of King John, which is open to the public, and where any amount of bread and butter, tea and buns, can be obtained at a slight cost. This, during the last year, drew 4,346 persons. The visitors to the Museum in the same year amounted to 7,000 persons (attendances at lectures and other meetings not included), and the numbers at all three places have been increasing year after year. The people come from a radius of twenty miles round, and it has been very successful, in so far as the number of visitors is concerned. I have built a small Museum Hotel, at which visitors to the locality can put up, and which has first-class accommodation. Another, called King John's Hotel, has sprung up in an adjoining village. Farnham has become the headquarters of a local bicycle club, which is named after the place. Bicycling is an institution that must not be overlooked in any project for the improvement of the masses. The enormous distances bicyclists can go by road, especially on a Sunday, has rendered the population of country districts locomotive to an extent that has never been known before. Fifty to sixty bicycles are frequently to be seen at my Sunday meetings at the Larmer Grounds, which average from 600 to 1,000 people, and the church on Sundays is crowded."

THE TEMPLE PRIMERS. (Dent, Bedford Street.)

The term primer is hardly applicable to this important series of manuals. They are of pocket size and pocket price, but of some of them we may certainly say that no better treatises are extant on the subjects which they concern. In that on Primitive Man we have a work which may be allowed to supersede Tyler, Lubbock, Dawkins, and a host of other excellent but expensive works of which the author has freely availed himself. All this for one shilling.

Many of the volumes are translations of works which appeared in France or Germany. Translations have their disadvantages, and these are not free from them, but at the same time they give opportunity for the transference at very small cost, from the literature of one nation to that of another, of works which have been in the first instance very costly, and which have stood the test of publication.

We strongly recommend all who are engaged in teaching

to obtain at once the whole series. We shall on a future occasion give specimens of the illustrations, which are liberally supplied.

CORRESPONDENCE.

TO THE EDITOR OF THE "MUSEUM GAZETTE."

DEAR SIR,—The attention of the King's Lynn Museum Committee, of which I am chairman, has been called to a statement with reference to their Museum, which appeared in your January issue, which is so very erroneous that, at their request, I am writing to correct it.

Under the heading "Museum Statistics" you summarise the information in "the Directory of Museums and Art Galleries" thus:—

"The following towns (twenty-four) possess but the nucleus of a Museum, one or two small rooms with few exhibits;" the list includes King's Lynn.

The actual facts as regards Lynn are as follows:—

We have a Natural History Room 75 ft. long, 42 ft. in average width, and an Art Room, 48 ft. by 36 ft. The former contains an extensive collection of birds, presented by the late John Henry Garney, who was member for the Borough in 1863. The cases alone for this collection cost £1,000. Recently there has been an addition of two extensive collections of British Birds, though one of these is on loan.

A classified collection of fossils, containing many specimens from nearly all the British strata, with maps showing the probable distribution of land and water in each geological period, and cards giving information of its fauna and flora.

A collection of local palæolithic and neolithic implements.

A large, properly-arranged and named collection of butterflies and moths.

A collection of land and fresh-water shells, &c., &c.

The Art Room has, it is true, but the nucleus of a picture gallery. It contains a number of paintings of South African landscapes, by Baines, the companion of Livingstone, and paintings of local scenes by his brother, who lived at Lynn.

I am,

Yours truly,

S. S. BURLINGHAM.

King's Lynn,

March 13, 1907.

IT would be ungracious to reply that our information was avowedly taken from another journal, and thus shift the blame for inaccuracy. We doubt not that the Editor of the MUSEUM JOURNAL will, with us,

rejoice to know that King's Lynn now deserves a better place than he gave it. There is, we believe, a widespread movement forward in our provincial museums. Eastbourne is one in which a much better museum has recently been built, which is likely, we believe, to be yet further enlarged. From personal knowledge we are aware that it ought not to have been placed in our list where it was. We shall be only too glad to be called upon to offer a similar apology and like congratulations to many other towns.—ED.

LIMBS REPAIRED AT SHORT NOTICE.

TO THE EDITOR OF THE "MUSEUM GAZETTE."

DEAR SIR,—It is annoying to buy an expensive umbrella one day and lose it the next. I am not quoting, only telling of what I have actually suffered. There are shops which give promise of "umbrellas recovered while you wait," but none of them specify how long you may have to wait for the promised recovery. There is something of the same indefiniteness in a passage which your reviewer last month (p. 515) introduces to notice from Mr. Sinel's "Outline of the Natural History of our Shores." It will be convenient to reproduce it: "One more curious feature in ecdysis. If a crab has, some time prior to the process, lost a leg or two, an eye or claw, the emerging form has these in perfection. (This quite independent of the frequent process of the replacement of lost limbs from a bud which appears on the scar.) If a limb gets broken off *just before* the moult I do not know what happens. This I have not seen, and in this book I am nowhere *quoting*, only telling of what I have observed."

The wording of the paragraph seems to imply that Mr. Sinel has himself seen cases in which a crab, that had been for some unspecified length of time minus an eye or a limb, has shed its coat and thereupon appeared with the missing appendage in full development. So novel an observation should surely be accompanied by some explanatory details. It has usually been supposed that anything like perfection in a restored crustacean limb is only gradually attained after several moultings. How such perfection can even be approached independently of the process of replacement from the bud on the scar is a new problem fraught with mystery. In thin-skinned species it is often easy to see what may be called a new appendage in great perfection within the old integument which is about to be discarded. But a perfected new limb ready to emerge from the stump of an old one verges so nearly on the miraculous that one would fain plead for further enlightenment on the new pathology.

Yours sincerely,
THOMAS R. R. STEBBING,

Ephraim Lodge,
The Common, Tunbridge Wells,
March 23, 1907.

THE regeneration of lost limbs in Crustaceans is a subject of extreme interest, and we join with Mr. Stebbing in the desire to know exactly what Mr. Sinel has himself seen. The facts do indeed as nearly approach the "miraculous" as any in the domain of Natural History. They hardly, however, can be considered to belong to "pathology," nor can we quite join our esteemed correspondent in thinking that Mr. Sinel's suggestion is new. In the best monograph on Crustaceans with which we are acquainted we read, respecting the *Cancer ruricola* "which relinquishes its limbs so easily as to produce the impression that they are only stuck on." "*The lost appendages would be renewed at the next change of skin.*" It would seem, therefore, that there was some glimmering perception of this miracle as far back as 1893. We shall be glad to publish any observed facts which Mr. Sinel, Mr. Stebbing, or any other of our readers, may incline to supply to us.—ED.

D. C. K.—The following list of rust fungi which occur in the latter part of April and throughout May will assist you :—

The Æcidiospores (clustercups) of *Uromyces poæ* on the Lesser Celandine, and the two common field buttercups.

The brown teleutospores of *U. ficariæ* also occur on the Lesser Celandine in April.

The Æcidiospores of *Puccinia lapsanæ* are formed on irregular purplish spots on the leaves of the Nipplewort.

The brown uredospores of *P. suaveolens* begin to appear on the leaves of the common field thistle soon after their appearance. This fungus has already been alluded to (see p. 50). The rapid growth of the infected plants will be most noticeable in May. The large dark brown uredospores of *P. taraxici* may be found near the end of the month on the Dandelion.

The uredospores of *P. lychidnearum* occur on pale yellow spots on the leaves the Red Campion in April, May and June. The beautiful clustercups of *P. tragopogi* thickly cover the leaves and stem of the common Goatsbeard.

The black-brown masses of teleutospores of *P. fusca* occur on the leaves of the Wood Anemone. The mycelium is perennial.

In the Moschatel parasite (*P. adoxæ*) the black pustules of the fungus may be found in abundance in April and May. The mycelium is perennial and teleutospores only are produced.

The rust occurring on leaves of the Golden Saxifrage is the *P. chrysosplenii*. Teleutospores only are produced.

The teleutospores of *P. buxi* occur on leaves of the Box.

Endophyllum euphorbiæ produces its teleutospores on the leaves of the Wood Spurge, arranged "in basipetal chains, enclosed in a

pseudoperidium of barren cells and resembling the Æcidiospores of Puccinia."

The teleutospores of *Gymnosporangium clavariæforme* occur on the branches of the Juniper in April and May, causing fusiform swellings. The spore mass is firm at first, then gelatinous and pale brown. Its Æcidiospores may be found on the Pear and Hawthorn from June to August.

The teleutospores of *G. juniperinum* appear in May. In this species the spore mass is brown and firm at first, then soft and orange coloured. The Æcidiospores may be found on the Mountain Ash from July to October.

The best book on the subject is Dr. Plowright's "Monograph of the British Uredineæ and Ustilagineæ (Kegan, Paul and Co.). Additional papers by the same author contributed to the *Transactions of the British Mycological Society* should also be consulted.

Notice to our Subscribers.

The present number completes the year's issue, and concludes our first volume.

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INDEX.

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Architecture. Views of the most interesting Collegiate and Parochial Churches in Great Britain, including Screens, Fonts, Monuments, &c. By John Preston Neale and J. le Keux. London, 1824. 2 vols, half calf, marbled boards. Plates much soiled by damp 5s

A Selection from the Harleian Miscellany of Tracts, which principally regard the English History, of which many are referred to by Hume. 4to half bound. London, 1793 2s 6d

Beauties of Flora—With Botanic and Poetic Illustrations. Being a Selection of Flowers drawn from Nature. Arranged emblematically, with directions for colouring. By Eliza E. Gledall. Vol ii. only 5s

(This work was published by the Authoress at Heath Hall, Wakefield, and is dedicated to the Lord Archbishop of York. It contains 21 coloured plates).

Berkshire. An incomplete copy of the History of Berkshire. Being pages 1 to 446, and map. Wanting title page and index. N D, but the map was published in 1806 by Cadell and Davies. It begins: "Asser Menevensis, an ancient English Historian informs us that this County derives its name from a wood, called Barroc." Shabbily bound in paper boards 5s

Biography. Chalmer's Biographical Dictionary containing an Historical and Critical Account of the Lives and Writings of the Most Eminent Persons in Every Nation, from the Earliest Accounts to the Present Time. New Edition, 1812, London, in 32 vols, half calf, marbled boards, uncut, in fine condition £1 15s

Biography. Life of Edward, Lord Herbert, of Cherbury. Written by himself. Third Edition. Dodsley. London, 1778, 4to, paper boards. Portrait of author 5s

Biography. The Letters and Works of Lady Mary Wortley Montagu. Edited by her Great Grandson, Lord Wharncliffe. With additions by W. Moy Thomas. Swan Sonnenschein Co., 1893, 2 vols, cloth. G. T. 10s 6d

Book of Common Prayer and Administration of the Sacraments, and other Rites and Ceremonies of the Church, &c., &c. London: Printed by John Bassett, Printer to the King's most excellent Majesty, 1739. Tooled russia, gilt 5s

Botany. Curtis's Botanical Magazine, or The Flower Garden Displayed. In which the most Ornamental Foreign Plants cultivated in the open ground, the greenhouse and the stove are accurately represented in their natural colours. Couchman, London, 1793-98, 12 vols bound in four, half calf, boards. (A few plates missing from each vol) £2 10s

Botany. Evelyn's Silva, or a Discourse of Forest Trees and the Propagation of Timber in His Majesty's Dominions. The fifth edition. London, 1729. Folio, old calf, rubbed, clean copy 10s 6d

Botany. Floral Emblems. By Henry Phillips. With 20 coloured plates. London, printed for Saunders and Otley, 1825, cloth, very scarce 10s 6d

Botany. Hortus Gramineus Woburnensis: or an Account of the Results of Experiments on the Produce and Nutritive Qualities of different Grasses and other Plants, used as the Food of the more Valuable Domestic Animals; Instituted by John, Duke of Bedford. Numerous coloured figures of the plants and seeds upon which these experiments have been made. By George Sinclair, F.L.S., F.H.S. Third Edition, London, 1826, Paper boards 10s

Botany. Johns' Flowers of the Field. 27th edition. 1892. Cloth, almost new 3s

Botany. M'Alpine's Botanical Atlas. Vol. II., Cryptogams. Containing 26 plates beautifully coloured. Edinburgh, 1883, 4to, out of print, scarce 10s 6d

Botany. Paxton's Magazine of Botany or Register of Flowering Plants. The first 3 vols. Orr and Smith, 1834-1836. Cloth gilt. Many coloured plates £2 2s

Botany. Turner's (Dawson) Fuci; or Seaweed. Coloured figures and description of the Plants referred by Botanists to the Genus Fucus (in Latin and English), 2 vols, royal 4to, with 129 very beautiful plates of Marine Plants, finely coloured from Nature. Full calf (rubbed) £3 3s

(Only a few copies were coloured, and are consequently very scarce. This splendid work has called forth the commendations of Naturalists in all parts of Europe.)

Botany. Very rare Black Letter Herbal. Translation by Henrie Lite of D. R. Dodœn's New Herball or Historie of Plants, containing the whole discourse and perfect description of all sorts of Herbs and Plants, their divers and sundry kinds, their names, natures, operations and virtues. The designed title page is missing. The curious dedication reads "To the most high, noble and renowned Princesse, our most dread redoubted Soveraigne Ladie Elizabeth, by the grace of God, Queene of England, France, and Ireland, defender of the faith, &c.," and concludes "From my poore house at Lytescarie within your Majesties Countie of Somerset, the first day of Januarie, 1578. Your Majesties most humble and faithfull subject Henrie Lite." Thick small 4to £2 17s 6d

In addition to the missing title page, a few pages of the Index are frayed and broken at the edges and there are a few wormholes; otherwise a good copy with well-preserved binding. Copies of later editions of this very rare book with as many as 22 pages missing have been sold for two guineas.

Ethic Amusements. By Mr. Bellamy, revised by his son, D. Bellamy, M.A., Chaplain of Petersham and Kew, in Surrey. London: Printed by W. Faden for the Author, 1768. 4to, half calf. Illustrated with 42 full page curious plates of fountains 5s 6d

Ferns. History of British Ferns. By Edward Newman. Van Voorst, 1854, cloth, uncut 6s 6d

Fossilium Metallia, et Res Metallicus concernentum Glebæ suis coloribus expressæ quas descripsit et digessit. D. Casimirus Christophorus Schmiedel impensis Johannis Michælis Seligmanni. Chalcographi Norimbergensis. Norimbergae, 1753. 4to, Leather, marbled boards, 42 coloured plates 6s

Herodotus, translated from the Greek, with notes. By the Rev. William Beloe. In 4 volumes. Second edition, corrected and enlarged. London, 1806. 8vo, full calf 10s 6d

Historical Collections of Private Passages of State, Weighty Matters in Law, Remarkable Proceedings in Five Parliaments. Beginning the Sixteenth Year of King James, Anno 1618, and ending the Fifth Year of King Charles, Anno 1629. Digested in Order of Time. Now published by John Rushworth of Lincoln's Inn. In 8 vols, folio, calf. Frontispiece Engraving of the Author. London, 1721 32s

History. A Selection from the Harleian Miscellany of Tracts, which principally regards the English History, of which many are referred to by Hume. London: Printed for C. and G. Kearsley, Fleet Street, 1793. Large 4to, half calf (defective), marbled boards 5s

History. Hardwicke's Miscellaneous State Papers, from 1501-1726. In two volumes. Full calf. Strahan, London, 1798 7s 6d

History. Niebuhr's Lectures on the History of Rome, from the Earliest Times to the Death of Constantine. Edited by Dr. Leonard Schmitz. London, 1849, 3 vols, cloth 10s 6d

History of the Early Part of the Reign of James II., with an Introductory Chapter by the Rt. Hon. Charles James Fox. To which is added an Appendix. Frontispiece engraving of a bust of Fox. Folio, tooled calf, marbled edges, clean copy, London, 1808 10s 6d

History of the Inns of Court and Chancery, including an account of the eminent men. By Robert R. Pearce, Esq., London, 1848, 8vo, cloth, binding rubbed 3s 6d

History, Whitelock Memorials of English Affairs, or an Historical Account of what passed from the Beginning of the Reign of King Charles I. to King Charles II., His Happy Restoration. Containing the Public Transactions, Civil and Military; together with the Private Consultations and Secrets of the Cabinet. Folio, calf, London, 1682 10s
(Containing passages afterwards suppressed.)

Huxley, Thomas Henry. Life and Letters of. By his son Leonard Huxley, 2 vols, 1900. With library label on cover, otherwise almost new 10s 6d

Illustrations of English History, Biography and Manners in the reign of Henry VIII., Edward VI., Mary, Elizabeth and James I. Executed in a series of Original Papers selected from the MSS. of the Noble Families of Howard, Talbot and Cecil; containing among a variety of interesting pieces a great part of the correspondence of Elizabeth and her Ministers, with George, the Sixth Earl of Shrewsbury, during the fifteen years in which Mary, Queen of Scots, remained in his Custody. With numerous Notes and Observations by Edmund Lodge, Esq., Pursuivant of Arms and F.S.A. In 2 vols, calf, royal 4to, London, 1791 12s

Joh. Christ. Fabricii. Entomologia systematica emendata et aucta. Hafniæ, 1792. Four vols, half calf, marbled boards. A sound copy with C. W. Dale's *ex libris* 10s 6d

Journal of the British Embassy to Persia. Embellished with numerous views taken in India and Persia. Also a Dissertation upon the Antiquities of Persepolis. By William Price, F.R.S.L. Vol. 1 only. Second Edition. London, 1825. Paper boards, imp. 4to., 5s

Journey from Chester to London. By Thomas Pennant, Esq. With notes London, 1811. Full calf, 8vo. Portraits and view, nice copy 10s 6d

Kirby and Spence. Introduction to Entomology. 7th Edition. Cloth. London, 1859 2s

Kennedy. Illustrated with coloured photographs. Eton, 1868, cloth, very scarce 21s

Owen's Memoir on the Mylodon: or a Description of the Skeleton of an Extinct Gigantic Sloth Mylodon robustus (Owen). With observations on the Osteology, Natural Affinities, and Probable Habits of the Megatherioid Quadrupeds in general. Pub. by Direction of the Council. London, 1842. Cloth, royal 4to (back broken) 10s 6d

Owen's Odontography. A Treatise on the Comparative Anatomy of the Teeth. 2 vols, with 150 plates, thick 8vo, half calf, London, 1840-45 £2

Palæontology. Fossils of the British Islands, stratigraphically and zoologically arranged. Volume 1, Palæozoic, comprising the Cambrian, Silurian, Devonian, Carboniferous and Permian species, with supplementary appendix brought down to the end of 1886. By Robert Etheridge, F.R.S. Oxford. At the Clarendon Press, 1888. Folio, cloth 8s 6d

A few pages are soiled, and some are annotated.

Palæontology, or a Systematic summary of the Extinct Animals and their geological relations. By Richard Owen. Edinburgh, 1860, cloth 4s

Palæontology. Parkinson's Organic Remains, 4to, London, 1804. Frontispiece and 9 coloured plates. Full calf, back broken 5s 6d

Palæontology. The internal structure of fossil vegetables found in the Carboniferous and Oolitic deposits of Great Britain. Described and Illustrated by Henry T. M. Witham, of Lartington. Adam and Charles Black, Edinburgh, 1833. Sixteen coloured plates. Folio, half roan 7s 6d

Parallel Bible. Being the Authorised Version arranged in parallel columns with the Revised Version. Oxford University Press, 1885, morocco gilt, minion, cr 4to 21s

Poems on Several Occasions. By Matthew Prior. London: Printed for Jacob Tonson at Shakespear's Head over against Katherine Street in the Strand, and John Barber upon Lambeth Hill, 1718. Folio, full calf, frontispiece 5s 6d

Quakers. A collection of Acts of Parliament and Clauses of Acts of Parliament Relative to those Protestant Dissenters who are usually called by the name of Quakers. From the year 1688. London: Printed by Luke Hinde, 1757. Folio, full calf 5s

Quinti Curtii Rufi de rebus gestis Alexandri Magni Regis Macedonum. Libri superstites, &c., &c., curavit and digessit Henricus Snakenburg. Delphis and Lugd. Bat. Apud; Adrianum Beman, Samuelem Luchtmans. 1724. 8vo, 824 pp. and copious index, vellum 13s 6d

Ray Society's Publications:—

Burmeister, H. Organisation of Trilobites deduced from their living affinities. Edited by Professor Bell and Edward Forbes. 6 plates, folio, boards, London, 1846 5s

Huxley, T. H. The Oceanic Hydrozoa. Description of the Calcycophoridæ and Physophoridæ observed during the voyage of H.M.S. "Rattlesnake." 12 plates, folio, boards, 1859 7s 6d

Nitzsch's Pterylography. Translated from the German. Edited by P. L Sclater. Folio, boards, 1867 10s 6d

Carpenter's Introduction to the Study of the Foraminifera. 22 plates, boards folio, 25s

Forbes, E. Monograph of the British Naked-eyed Medusæ. 13 coloured plates, folio, boards, 1848 7s 6d

Allmann, G. T. Monograph of the Freshwater Polyzoa, including all the known species, both British and Foreign. 11 coloured plates, folio, boards, 1856, very scarce 30s

Recent Memoirs on the Cetacea. By Eschricht, Reinhardt and Lillieborg. Edited by W. Flower. 6 plates, folio, boards, 1866 10s 6d

Kitchin, Parker. Monograph on the Structure and Development of the Shoulder-Girdle and Sternum in the Vertebrata. 30 plates, folio, boards, 1868 15s

Rhodesia. Sunshine and Storm in Rhodesia. By Frederick Courteney Selous. Map and numerous illustrations. Rowland Ward, 1896 5s 6d

Shakespeare. Further particulars regarding Shakespeare and his Works. In a letter to the Rev. Joseph Hunter

F.S.A., from J. Payne Collier, F.S.A. London: Thomas Rodd, 1839. Thin sup. roy 8vo, cloth. Very rare, only 50 copies printed, pages uncut 17s 6d

Sporting. A sporting tour through the northern parts of England, and great part of the Highlands of Scotland. By Colonel T. Thornton. A new Edition, with coloured plates by G. E. Lodge, &c. Edward Arnold, London, 1896 10s 6d

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Tour from Alston Moor to Harrogate and Brimham Crags. By Thomas Pennant, Esq. C. Mercier and Co., London, 1804. Folio, half roan, binding shabby 8s 6d

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Travel. A Journey from Aleppo to Jerusalem at Easter, A.D. 1697. By Henry Maundrell. Also a Journal, from Grand Cairo to Mount Sinai and back again. By the Right Rev. Robert Clayton. To which is added a faithful account of the Religion and Manners of the Mahometans, by Joseph Pitts. London, 1817. Paper boards, binding defective 6s

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Travel. Narrative of Sir John Ross' Search for the North-West Passage, and of a residence in the Arctic Regions during the years 1829-1833. Thick, 4to, cloth. A. Webster, London, 1835 12s 6d

Numerous illustrations, several in colour, but all are foxed.

Travels of M. de Thevenot into the Levant. In 3 parts. I. Turkey; II. Persia; III. East Indies. Newly done out of French by R. L'Estrange. In one vol. London, 1687. Portrait missing 5s 6d

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CONTENTS FOR JULY, 1906.

CONTENTS FOR JUNE.

(*Continued on p.* 3 *of cover.*)

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CONTENTS FOR AUGUST, 1906.

CONTENTS FOR JULY.

(*Continued on p. 3 of cover.*)

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CONTENTS FOR SEPTEMBER, 1906.

CONTENTS FOR AUGUST.

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CONTENTS FOR MARCH, 1907.

CONTENTS FOR FEBRUARY.